State Route 84 Realignment and Widening

Initial Study/Environmental Assessment

State Route 84 (Vallecitos Road)

Pigeon Pass in Alameda County

04-ALA-KP 33.3/37.0

(PM 20.7/23.0)

04-172400

April 2005

General Information About This Document

What's in this document?

The California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA) have prepared this Initial Study/Environmental Assessment, (IS/EA) which examines the potential environmental impacts of the alternatives being considered for the proposed project located in Alameda County, California. The document describes why the project is being proposed, alternatives for the project, the existing environment that could be affected by the project, the potential impacts from each of the alternatives, and the proposed avoidance, minimization and/or mitigation measures.

This document meets both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) which require the preparation of an IS/EA when it has been determined that a project involving State and/or Federal funds may have the potential for significant environmental impacts to the environment. The IS/EA has examined the potential impacts and determined that no significant impacts will result from the project, resulting ina Negative Declaration (under CEQA) and a Finding of No Significant Impact (under NEPA). These determinations are included in this IS/EA.

The IS/EA was circulated to the public for 30 days, from June 7 to July 7, 2004. Comments were received from the public and incorporated into this document in Chapter 5.

What happens after this?

Following approval of this document, the Department and FHWA may: (1) give environmental approval to the proposed project, (2) undertake additional environmental studies, or (3) abandon the project. If the project were given environmental approval and funding were appropriated, Caltrans could design and construct all or part of the project.

For individuals with sensory disabilities, this document could be made available in Braille, large print, on audiocassette, or on computer disk. To obtain a copy in one of these alternate formats, please call or write to Caltrans, Attn: Ron Kiaaina, Project Manager, P.O. Box 23660, Oakland, CA 95623-0660; (510) 286-4193 Voice, or use the California Relay Service TDD line at 1-800-735-2929.

SCH #
04-ALA-84-KP 33.3/37.0
(PM 20.7/23.0)
EA 04-172400

Realignment and widening of State Route 84 in Alameda County
Through the Vallecitos Hills / Pigeon Pass Area southwest of Livermore
KP 33.3/37.0 (PM 20.7/23.0)

INITIAL STUDY/ENVIRONMENTAL ASSESSMENT

Submitted Pursuant to: (Federal) 42 USC 4332(2)(C)
(State) Division 13, Public Resources Code

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration, and

THE STATE OF CALIFORNIA
Department of Transportation

March 26, 2004
Date of Approval

John D. Webb
Chief, Office of Environmental Services
California Department of Transportation

March 30, 2004
Date of Approval

for
Division Administrator
Federal Highway Administration

Finding of No Significant Impact (FONSI)

Caltrans

Finding of No Significant Impact
For
State Route 84 Realignment and Widening

This project will improve safety and operations on State Route 84 in Alameda County between mileposts 20.7 and 23.0 . The project will upgrade horizontal and vertical alignment to expressway standards. Phase I of the project will add a median, turn pockets, wider through-lanes and shoulders. Phase II includes adding climbing lanes in both directions over Pigeon Pass on State Route 84.

The Federal Highway Administration (FHWA) has determined that, after study and examination, the proposed project will have no significant impact on the human environment. This Finding of No Significant Impact (FONSI) is based on the attached Environmental Assessment, dated March 2005, and related technical studies. These documents have been evaluated by the FHWA and determined to adequately and accurately discuss the need, environmental issues and impacts of the proposed project. The documents provide sufficient evidence and analysis for determining that an Environmental Impact Statement is not required.

The Federal Highway Administration has cooperated with the California Department of Transportation and takes full responsibility for the accuracy, scope, and content of the attached Environmental Assessment.

4-11-2005
date

For Gene K. Fong
Division Administrator
Federal Highway Administration

Negative Declaration

Caltrans

State of California
Department of Transportation

SCH Number: 2004062018
04-ALA-84
KP 33.3/37.0
(PM 20.7/23.0)

Negative Declaration

Pursuant to: Division 13, Public Resources Code

Project Description

The California Department of Transportation (Caltrans) proposes to realign and widen a 3.7-kilometer (2.3-mile) portion of State Route (SR) 84 from kilometer post 33.3 to 37.0 (post mile 20.7 to 23.0) in the Vallecitos Hills/Pigeon Pass area of Alameda County.

The project will improve safety by upgrading the horizontal and vertical alignment of SR 84 to meet expressway design standards. The project proposes three alternatives having different horizontal and vertical alignments. Each alternative proposes to phase in climbing lanes over Pigeon Pass in both eastbound and westbound directions. Depending upon the alternative, the existing SR 84 would be eliminated or converted to a frontage road.

Determination

Caltrans has prepared an Initial Study, and determined from this study that the proposed project would not have a significant effect on the environment for the following reasons:

- The proposed project would have no effect on air quality, land use, mineral resources, cultural resources, population and housing, floodplains, recreation, public services, transportation, traffic patterns, and utilities.
- The proposed project would have a less than significant effect on, farmlands, water quality, geology, soils, hydrology, and hazardous waste.
- Potential impacts to visual resources would be mitigated through the use of design features such as contour grading and slope-rounding, and by revegetation of disturbed areas.
- Potential impacts to water quality during construction would be mitigated through the use of Caltrans Best Management Practices.
- Potential impacts to riparian vegetation would be mitigated.

- Potential impacts to western burrowing owl, loggerhead shrike, red-tailed hawk, San Joaquin kit fox, vernal pool fairy shrimp, California linderiella fairy shrimp, California red-legged frog, California tiger salamander, and western pond turtle would be mitigated.
- Wetland impacts would be mitigated at an appropriate mitigation bank.

for John D. Webb
Chief, Office of Environmental Services
California Department of Transportation

April 19, 2005
Date

Summary

Caltrans

Summary

This Initial Study (IS)/Environmental Assessment (EA) has been prepared to meet the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) for projects that could have adverse impacts on the environment. The following summary identifies major items of importance regarding the proposed project. Detailed project information is presented in the body of the document.

Proposed Action

The California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA) are proposing a highway safety project on State Route (SR) 84 in Alameda County. The proposed project would realign and widen a 3.7-kilometer (km) (2.3-mile) section of SR 84 from kilometer post (KP) 33.3 to 37.0 (post mile [PM] 20.7 to 23.0) through the Vallecitos Hills, southwest of Livermore. State Route 84 within the project limits is currently a two-lane conventional highway with 3.6-meter (m) (12.0-foot [ft]) wide lanes and shoulders that are typically 0.3 m (1 ft) to 0.6 m (2 ft). The alignment of the existing roadway imposes driving restrictions such as limited sight distance and difficulties in negotiating sharp curves. The project under consideration would improve the existing horizontal and vertical alignment, which would result in improved safety and traffic operations. A second phase of this project would add a climbing lane over Pigeon Pass in both directions.

Project Alternatives

Three alternatives are proposed to meet the purpose and need of improving safety and traffic operations. All three alternatives improve the horizontal and vertical alignment to meet expressway design standards, provide 3.6-m (12.0-ft) wide lanes and 3.0-m (10.0-ft) wide shoulders and include climbing lanes over Pigeon Pass in both eastbound and westbound directions. All three alternatives provide a 3.6-m (12.0-ft) wide median. This median will accommodate left-turn pockets for vehicles accessing private properties along SR 84. All three alternatives require the relocation of a natural gas transmission pipeline located approximately 560 m (1837 ft) west of Pigeon Pass. A No Build Alternative, which would maintain existing conditions, is also included. All project alternatives are defined in detail in Chapter 2.

Impacts and Mitigation

This project would result in impacts to nine special status species including: western burrowing owl, loggerhead shrike, red-tailed hawk, San Joaquin kit fox, vernal pool fairy shrimp, California linderiella fairy shrimp, California red-legged frog, California tiger salamander, and western pond turtle. Impacts for each of the three alternatives are similar. Consultation with the U.S. Fish and Wildlife Service has been completed and a Biological Opinion (BO) has been issued. The BO outlines the mitigation measures pertaining to these species and is contained in Appendix E of this document.

There would be impacts to 0.4 hectares (1.0 acres) of wetlands, which would be mitigated at a mitigation bank at a ratio determined prior to the permit process with input from the Army Corps of Engineers (ACOE). There would be 0.13 hectares (0.31 acres) of impacts to "other waters of the U.S.". Most are temporary impacts from the addition of culverts. To minimize impacts from culvert installation Caltrans will restore banks to their original condition and revegetate with native species.

Ten parcels of property would be affected. Depending on the alternative, one residential relocation would be required. Fair market price would be paid for the property and relocation assistance provided.

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List of Technical Studies that are Bound Separately

- Air Quality and Noise Analysis
- Hazardous Waste Evaluation
- Historical Property Survey Report (HPSR)
  - Historic Resource Evaluation Report
  - Negative Archaeological Survey Report
- Natural Environment Study (NES)
- Biological Assessment (BA)
- Visual Impact Assessment (VIA)

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List of Abbreviated Terms

ac	acre
ACOE	United States Army Corps of Engineers
ADA	American Disabilities Act
APE	Area of Potential Effects
BMP	Best Management Practices
Caltrans	California Department of Transportation
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
dbh	diameter at breast height
DOT	U.S. Department of Transportation
EPA	United States Environmental Protection Agency
ESA	Environmentally Sensitive Area
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
ft	foot/feet
ha	hectare
in	inch
km	kilometer(s)
KP	kilometer post
m	meter(s)
mi	mile(s)
NEPA	National Environmental Policy Act
NEPA/404	National Environmental Policy Act/404
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
PM	post mile
RWQCB	Regional Water Quality Control Board
SCR	Senate Concurrent Resolution
SHPO	State Historic Preservation Office
SR	State Route
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USFWS	United States Fish and Wildlife Service

Chapter One

Proposed Project

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Chapter 1 Proposed Project

1.1 Project Purpose and Need

The purpose of the project is to realign and widen a 3.7 km (2.3 mi) section of State Route (SR) 84 through the Vallecitos Hills/Pigeon Pass area in Alameda County. This project is being proposed because the segment of SR 84 that passes through the Vallecitos Hills/Pigeon Pass area has become functionally obsolete due to a combination of the existing features of the highway and increased volume of traffic. Shoulder widths do not meet current design standards. There are no opportunities to pass slower moving vehicles and no pull-outs exist within the project limits. This project would improve the existing horizontal and vertical alignment and bring this section of roadway up to current design standards.

Grades on SR 84 reach a maximum of 10.9% and at some locations stopping sight distance is limited by the curvature of the highway. This section of SR 84 is the most winding section in Alameda County. Southwest of the project area the road is fairly flat with large radius curves and a 90 km/h (55 mph) regulatory speed limit. Within the project area, the regulatory speed drops to 80 km/h (50 mph) with 25-, 30-, 35-, and 40-mph warning signs posted at numerous curves. At the northeast end of the project area SR 84 enters a more populated area, the regulatory speed remains 80 km/h (50 mph), and the road becomes flatter and less curving.

During peak hours, traffic is congested due to the winding alignment of the roadway through this area. This congestion has contributed to a collision rate that is higher than the statewide average. The average accident rate per million vehicle miles (acc/mvm) for a two-lane conventional highway is expected to be about 1.32 acc/mvm. The actual accident rate for SR 84 through the project area is 1.42 acc/mvm. Improving the alignment and widening the roadway is expected to lower the accident rate on this section of roadway.

1.2 Project Description

The project proposes to upgrade SR 84 to meet expressway design standards. Three design speed alternatives are considered: 80-, 90-, and 105-km/h (50-, 55-, and 65-mph). Each alternative has different horizontal and vertical alignments and depending

on funding will add climbing lanes over Pigeon Pass as a second phase of the project. The following project description is common to all three alternatives.

Climbing lanes: Each alternative will include climbing lanes over Pigeon Pass in both eastbound and westbound directions as a second phase of the project. The westbound climbing lane begins west of the signalized intersection at Ruby Hills Drive and SR 84 and merges back approximately 500 m (0.3 mi) west of Pigeon Pass. The eastbound climbing lane begins prior to the 6% uphill grade west of Pigeon Pass, continues over Pigeon Pass and either merges or continues to the intersection of Ruby Hills Drive, depending on the alternative. Adding climbing lanes for slower vehicles to be passed would increase traffic safety and improve operations.

Median and Lane Width: The two traveled lanes will each be 3.6 m (12.0 ft) wide. The first phase of the project will include a 1.8-m (6-ft) wide median buffer with 3.6-m (12-ft) wide turn-pockets where needed and 2.4-m (8-ft) wide shoulders. The second phase of the project will construct 3.0-m (10-ft) wide shoulders and a 3.6-m (12.0-ft) wide median, which will accommodate a left-turn pocket for vehicles accessing private properties along SR 84 and will also provide an acceleration lane for vehicles entering SR 84 from private properties.

Access: The project maintains access to existing driveways along the project's length. Access to a large parcel located south of SR 84 and west of Pigeon Pass will be provided via a proposed vehicular undercrossing. The proposed undercrossing structure is a structural steel plate arch culvert that is approximately 6.2 m (19.6 ft) wide by 5.4 m (18 ft) high and 40 m (131 ft) long. The undercrossing will also serve as a wildlife crossing. Another undercrossing for vehicles and wildlife will be located near the east end of the project.

Relocation of Utilities: The project would require the relocation of a 0.60-m (2.0-ft) diameter natural gas transmission pipeline and approximately 1900 m (6334 ft) of overhead electrical distribution lines.

Frontage Road: Depending upon the alternative, the existing SR 84 (Vallecitos Road) could be eliminated or ultimately be converted to a frontage road.

1.3 Project Background

Located southwest of the City of Livermore, a segment of SR 84 (also signed as Vallecitos Road) traverses the Vallecitos Hills on a winding alignment that generally

follows the natural topography (Figure 1.1). The crest of the roadway over the Vallecitos Hills is known locally as "Pigeon Pass". This segment of SR 84 through the Vallecitos Hills was originally constructed in 1931 as a county road and later adopted by the State as a conventional highway. Today Vallecitos Road serves local traffic from Livermore and Pleasanton, and is heavily used by commuters heading to and from Silicon Valley. This section of SR 84 also serves as a bypass between I-580 and I-680.

The existing circuitous alignment has a regulatory speed of 80 km/h (50 mph) with 35-mph warning signs posted at numerous curves. State Route 84 has shoulders that vary in width from 0.3 m (1 ft) to 2.4 m (8 ft), but are typically less than 0.6 m (2 ft). The average daily traffic on SR 84 has increased from 12,800 vehicles per day in 1993 to 17,800 vehicles per day in 2002. Accident records show a higher than average accident rate for this segment of SR 84 through the Vallecitos Hills.

A project to improve safety and traffic operations on SR 84 through the Vallecitos Hills was initiated in 1998. A Project Study Report (PSR) was prepared and approved in 1999 for a 2.9 km (1.8 mi) long project to realign and widen SR 84 beginning at KP 34.2 (PM 21.3) and ending at KP 37.1 (PM 23.0). The proposed project would realign and widen SR 84 on either side of Pigeon Pass.

In January 2000, the Tri-Valley Transportation Council (TVTC) initiated agreements to begin work on a PSR for improving the SR 84 Corridor between Interstate (I)-580 and I-680. The TVTC is a joint powers agency made up of seven agencies: the Cities of Livermore, Dublin, San Ramon, Danville and Pleasanton, and Alameda and Contra Costa Counties. The TVTC has prepared a transportation plan for the Tri-Valley area, and each member agency has established a traffic impact fee to provide a portion of the funding for eleven projects of regional significance. One of the top priority projects is to improve SR 84 between I-580 and I-680.

In May 2000, the TVTC began work with Caltrans on a SR 84 Corridor PSR to identify and develop the ultimate geometric alignment for SR 84 between I-580 and I-680. The corridor generally conformed to the route adopted in November 1960 by the California Highway Commission, which moved a portion of SR 84 to the Isabel Avenue Corridor from its present alignment through the central part of the City of Livermore. A SR Transfer Report was prepared by the City of Livermore to officially transfer the existing SR through downtown Livermore (First Street) to the Isabel Avenue corridor by late 2003.

In addition to the alternatives prepared for the Isabel Avenue Corridor, the SR 84 Corridor PSR identified alternatives that would realign SR 84 through the Vallecitos Hills/Pigeon Pass area. Five possible alignments were studied from which two were recommended for further study in the SR 84 Corridor Project Report. The ultimate facility for SR 84 through the Vallecitos Hills/Pigeon Pass area is proposed as a 4-lane expressway having climbing lanes over Pigeon Pass. The typical cross section provides for a 6.6-m (22.0-ft) median with a concrete barrier, four 3.6-m (12.0-ft) wide lanes, 3.6-m (12.0-ft) wide climbing lanes (where needed) and two 3.0-m (10-ft) wide outside shoulders. The horizontal and vertical alignments would meet expressway standards for mountainous terrain.

The Project Development Team (PDT) developed three alternatives, for the current project under consideration based on varying design speeds for mountainous terrain. The design speed for an expressway in mountainous terrain can vary from 80 km/h (50 mph) to 130 km/h (81 mph) per the Highway Design Manual (HDM). Three viable alternatives are listed below:

- 80 km/h (50 mph) Design Speed Alternative
- 90 km/h (55 mph) Design Speed Alternative
- 105 km/h (65 mph) Design Speed Alternative

These alternatives meet the expressway standards for the ultimate SR 84 facility. Coordination efforts with the SR 84 Corridor Project Report are ongoing.

It is anticipated that improvements to upgrade SR 84 to expressway standards between I-580 and I-680 would occur sometime in the future, depending upon the availability of local funding. Therefore, it would be beneficial to have this project conform to the future ultimate alignment.

In August 2004 a pavement rehabilitation project was completed on SR 84 adjacent to the limits of the currently proposed project. This project widened existing shoulders and placed pavement overlays between I-680 and the westerly limit of the currently proposed safety project and from Ruby Hill Drive to Isabel Avenue on the easterly end of the proposed safety project.

1.4 Permits and Approvals Needed

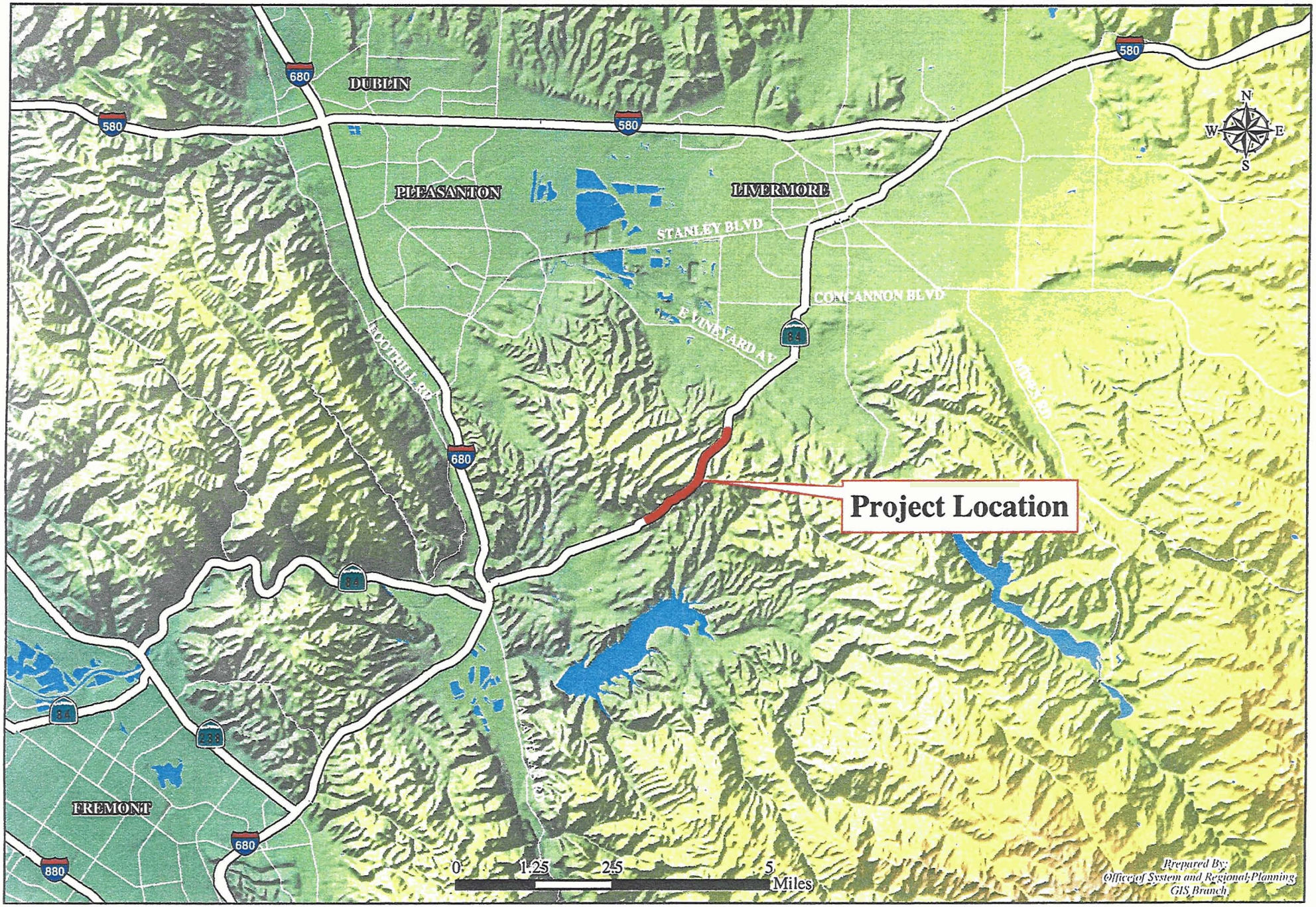
The following permits, reviews, and approvals would be required for project construction:

Table 1.4 Permits and Approvals Needed

Agency	Permit/Approval	Status
United States Fish and Wildlife Service (USFWS)	Consultation for Threatened and Endangered Species under Section 7 of the Federal Endangered Species Act.	Consultation with USFWS initiated on February 17, 2004.
United States Army Corps of Engineers (ACOE)	Section 404 Individual Permit for filling or dredging waters of the United States.	Application for Section 404 permit to be submitted during Plans, Specifications and Estimate (PS&E)
California Department of Fish and Game (CDFG)	1602 Agreement for Lake and Streambed Alteration	Application for 1602 permit to be submitted during PS&E
California Department of Fish and Game (CDFG)	Section 2080.1 Agreement for Threatened and Endangered Species	Application for 2080.1 Agreement to be submitted during PS&E
San Francisco Bay Regional Water Quality Control Board	Section 401 Water Quality Certification	Application for Section 401 permit to be submitted during PS&E

Location Map
Route 84 Realignment at Pigeon Pass

EA 17240
ALA-84-PM21.0/23.1



Chapter Two

Project Alternatives

Caltrans

Chapter 2 Project Alternatives

2.1 Alternative Development Process

The Project Development Team (PDT) considered the project background, the ultimate facility and environmental constraints when developing the alternatives presented below. The overall goal was to develop a project that would be compatible with the future SR 84 facility while minimizing the need for interim work.

2.2 Project Alternatives

Features common to Phase I of the three build alternatives are described below, with further details of each alternative following.

- Improved horizontal and vertical alignments, which meet expressway design standards, and are compatible with the future alignment of SR 84 through the Vallecitos Hills/Pigeon Pass area.
- One 3.6-m (12-ft) wide lane and 2.4-m (8-ft) wide shoulder in each direction.
- A 1.8-m (6-ft) wide median buffer with 3.6-m (12-ft) wide turn-pockets where needed.
- A 29.0-m (95-ft) wide grading plane (hinge to hinge) to accommodate a future median barrier and a median width that meets minimum expressway standards in mountainous terrain.
- Continued access to existing driveways and two vehicular undercrossings at a private road and 500 m (1640 ft) west of the Ruby Hills Drive intersection. The undercrossings will also serve as wildlife crossings.
- The relocation of a 0.60-m (2-ft) diameter natural gas transmission pipeline located approximately 560 m (1840 ft) west of Pigeon Pass, and the relocation of wooden pole electrical distribution and transmission lines along existing SR 84.

Additional features common to Phase II of the three build alternatives are described below. Phase II will be constructed at a later time, dependent on funding.

- 3.6-m (12-ft) wide climbing lanes over Pigeon Pass in both eastbound and westbound directions.
- A 3.0-m (10-ft) wide shoulder in each direction.

- A 3.6-m (12-ft) median which will accommodate left-turn pockets for vehicles accessing private properties along SR 84 and will also provide an acceleration lane for vehicles entering SR 84 from private properties.

2.2.1 Build Alternatives

80 km/h (50 mph) Design Speed Alternative

Additional features of this alternative are:

- Due to the proximity of the proposed realignment to the existing alignment the majority of the existing roadway would be removed or covered with earth fill.
- Approximately 300,000 cubic meters of excess material would be generated requiring designation of a disposal site.
- Approximately 16.4 hectares (ha) (40.5 acres [ac]) of new right-of-way would be required.
- A Type 1 retaining wall is proposed along the north side of SR 84 near the top of cut slope from station 80+00 to station 81+00. A retaining wall is necessary to protect private properties in the Ruby Hills Subdivision.
- A Type 1 retaining wall is proposed along the south side of SR 84 from station 79+00 to station 80+80. A retaining wall is necessary to reduce impacts to a residence located south of SR 84.

90 km/h (55 mph) Design Speed Alternative – Preferred Alternative

Additional features of this alternative are described below:

- Existing SR 84 (Vallecitos Road) would be used as a frontage road. This frontage road will provide access to private properties north of SR 84 for the majority of the project's length, and serve as a bicycle route. It will also provide a corridor for utilities in the future when SR 84 becomes an expressway.
- Earthwork for this alternative is balanced. Therefore, a disposal site is not necessary.
- Approximately 28.5 ha (70.4 ac) of new right-of-way including one residence is required. Relocation assistance would be provided.

105 km/h (65 mph) Design Speed Alternative

Additional features of this alternative are described below:

- Portions of existing SR 84 would be used as a partial frontage road system. The existing SR 84 alignment would provide access to private properties north of SR 84. This alternative does not provide for a continuous frontage road.
- Earthwork for this alternative is balanced. Therefore, a disposal site is not necessary.
- Approximately 32.0 ha (79.2 ac) of new right-of-way is required including one residence. Relocation assistance would be provided.

Refer to Appendix D for plans and further details.

2.2.2 No Build Alternative

The "no build" alternative would maintain the existing conditions. This alternative would have no environmental impacts and no mitigation would be required. The "no build" alternative would not improve safety or traffic operations.

2.2.3 Comparison of Alternatives

All three of the build alternatives have similar impacts to special status species and sensitive resources. See Table 2.1 for a comparison of the alternatives' costs, impacts, and features. See Figures 2.1, 2.2, and 2.3 for maps of the three design speed alternatives

Table 2.1 Comparison of Alternatives

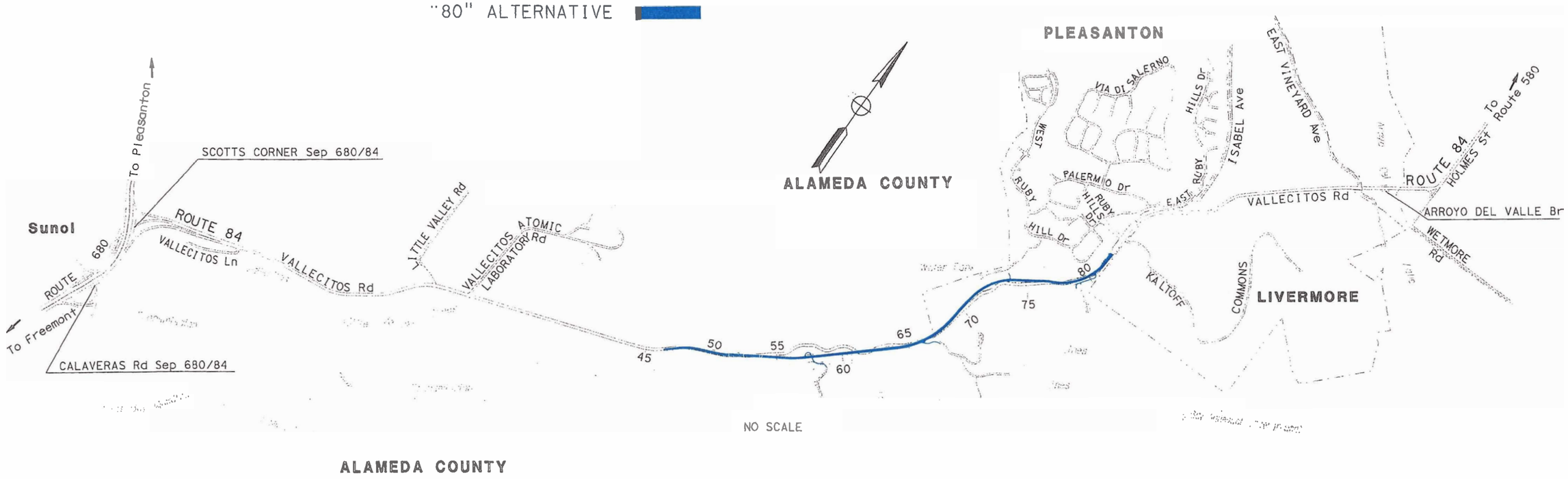
	80 km/h Alternative	90 km/h Alternative	105 km/h Alternative	No Build Alternative
Wetlands*	>1.5	1.5	1.5	None
Riparian Areas*	>4.5	4.5	>4.5	None
Oak Woodland*	<1.9	1.9	1.9	None

Kit Fox habitat*	>79.2	79.2	>79.2	None
Fairy Shrimp habitat*	0.6	0.6	0.6	None
California Tiger Salamander habitat*	>87.2	87.2	<87.2	None
Red-legged Frog habitat*	>4.4	4.4	>4.4	None
Environmental Mitigation Costs**	$3.2	$2.2	$2.5	None
Current SR 84 turned into frontage road	No	Yes	No	No change
Retaining wall needed	Yes	No	Yes	No
Disposal site needed for excess soil	Yes	No	No	No
Acres of new right-of-way required	40.4	67.0	79.2	None
Residential Relocations	None	One	One	None
Utility Relocation Costs**	$3.2	$1.0	$1.0	None
Total Project Costs (Phase I and II)**	$27.3	$26.7	$31.5	None

* Numbers shown in acres. Amount includes current Caltrans right-of-way.
**Costs shown in millions

LEGEND

"80" ALTERNATIVE

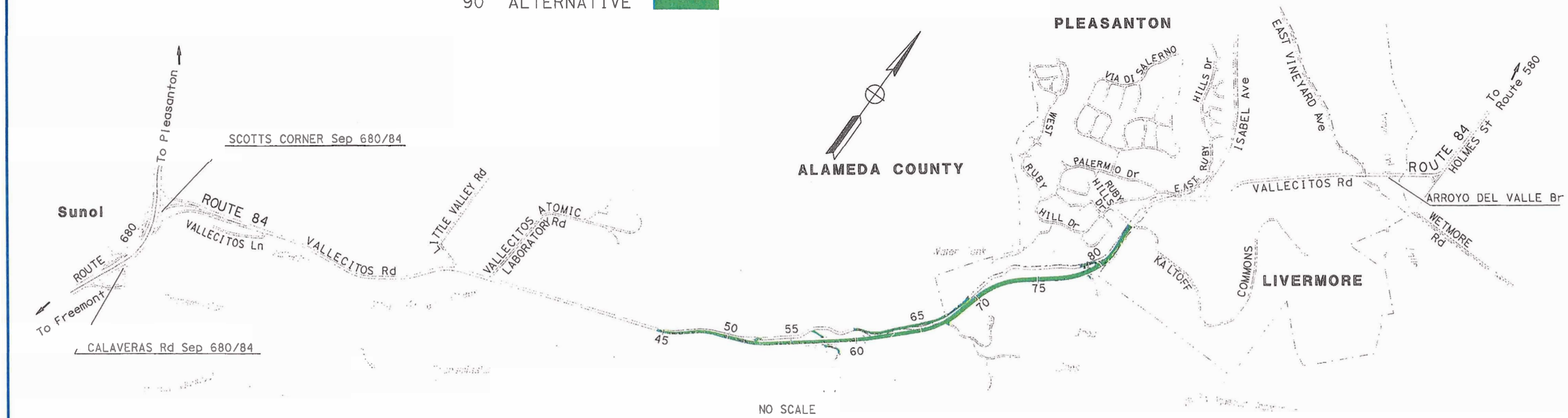


80 km/h (50 mph)
DESIGN SPEED ALTERNATIVE

Caltrans

LEGEND

"90" ALTERNATIVE

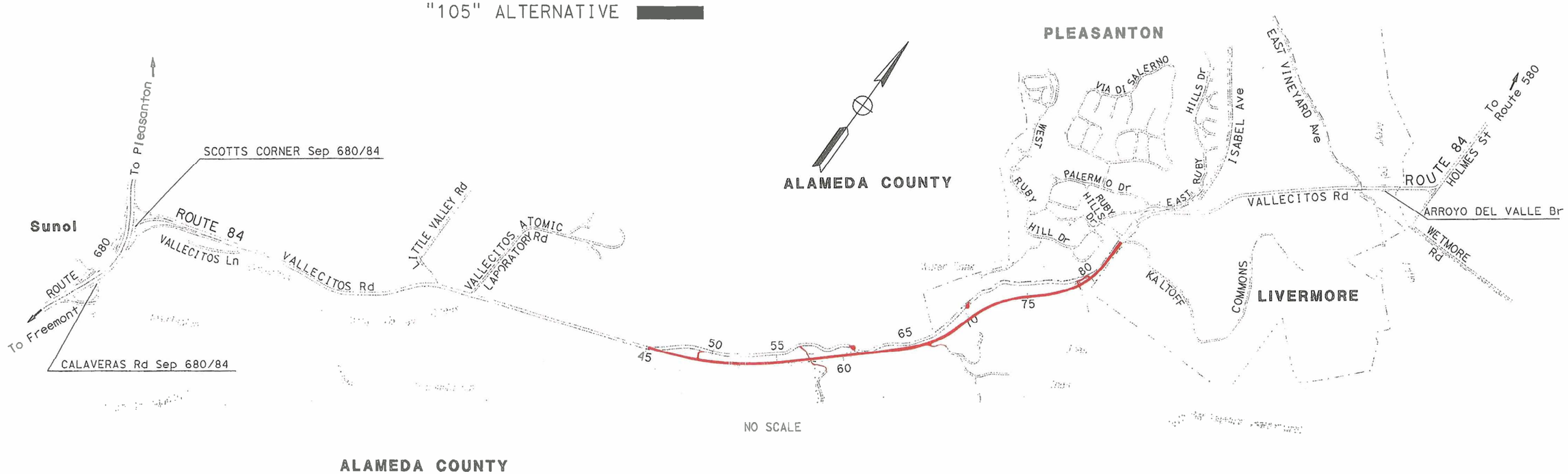


90 km/h (55 mph)
DESIGN SPEED ALTERNATIVE

Caltrans

LEGEND

"105" ALTERNATIVE



105 km/h (65 mph)
DESIGN SPEED ALTERNATIVE

Caltrans

Chapter Three

Affected Environment, Environmental Consequences, and Mitigation Measures

Chapter 3 Affected Environment, Environmental Consequences, & Mitigation Measures

3.1 Water Quality and Storm Water Runoff

The federal Clean Water Act (CWA) of 1972 addresses water pollution control and water quality protection. The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States for their beneficial uses. Federal environmental regulations based on the CWA have evolved to require the control of pollutants from municipal separate storm systems (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, and storm drains) and construction activities (clearing, grading, and excavation). Discharges from such sources were brought under the National Pollution Discharge Elimination System (NPDES) permit process by amendments to the CWA in 1987 and the subsequent 1990 promulgation of storm water regulations by the EPA. In California, the U.S. Environmental Protection Agency (EPA) has delegated administration of the federal NPDES program to the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs). Caltrans was issued NPDES permit no. 99-06-DWQ on July 15, 1999, to cover all municipal and construction storm water activities. Caltrans is responsible for the development of a Storm Water Pollution Prevention Plan (SWPPP) for all projects that disturb more than 0.4 ha (1.0 ac) of total land area.

3.1.1 Affected Environment

The proposed project is under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board. The project is located in the Livermore Valley watershed, which is surrounded by the hills of the Diablo Range. The creeks within the project limits are small seasonal drainages. The creeks on the west side of Pigeon Pass drain into Vallecitos Creek, which drains to Arroyo de la Laguna and the San Antonio Reservoir. The creeks on the east side of Pigeon Pass drain into Arroyo del Valle. Arroyo de la Laguna and Arroyo del Valle are included in the EPA's 303(d) listing for the pollutant Diazinon (pesticide). Diazinon is not used for roadside maintenance, therefore highway runoff is not a likely contributor to this pollution.

The receiving water bodies are not considered High Risk Areas used for municipal or domestic water supply.

3.1.2 Impacts

Approximately 16 to 32 ha, (40 to 79 ac) of new right-of-way would be required, depending on the alternative selected. Cut and fill slopes will vary from 1:2 with multiple benches to 1:4 or flatter.

The proposed project would require excavation, grading, roadway construction, and loss of vegetation, all of which result in soil and ground disturbances. These disturbances would create loose and/or unprotected soil that, if not properly managed and contained on the project site, could be carried by surface runoff, or wind, to watercourses. Such increases in sediment and turbidity could adversely affect receiving water quality.

Construction activities may introduce chemicals, oils, and greases that could be carried by surface runoff to surface water, if not properly managed. These impacts have the potential to occur for the duration of construction. Highway runoff and other long-term maintenance activities may also introduce these pollutants to surface water.

3.1.3 Mitigation Measures

The contractor would be required to prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) to protect receiving waters from pollution. A site-specific SWPPP would be developed and implemented as required by the Caltrans Statewide NPDES permit.

To reduce impacts due to erosion, sedimentation, and introduced pollutants, both temporary and permanent erosion control measures would be implemented. These measures include, but are not limited to, the following:

- All "in-water" work would comply with standards set by the San Francisco Bay Regional Water Quality Control Board. The contractor's work would comply with the water pollution protection provisions of Section 7-1.01G of Caltrans Standard Specifications and SWPPP, as well as with all conditions contained in regulatory permits.

- Prior to excavation, temporary erosion control fencing would be placed down slope of areas where disturbance of native soil is anticipated. The temporary fence would be maintained in a functional condition until soil disturbance activities are complete and permanent erosion control is applied. Loose soil built up behind the fencing would be incorporated into the slope or taken offsite.

- Best Management Practices (BMPs) such as infiltration basins, detention basins, bio-strips and swales would be implemented, in addition to any other measures described in the Caltrans Construction Site BMP Manual.

- Hydraulic design techniques such as flared end sections on culverts, rock slope protection (RSP), paved water conveyances and energy dissipater pads would be used.

- The contract specification for permanent erosion control would require the use of California native forbs and grass species, from the same elevation and geographic area as the project site.

- Soils would be amended with compost containing long-term soil nutrients and slow-release organic fertilizers to provide nutrients over the first year. Mulches used on the project would be from source materials that would not introduce exotic species. No wheat or barley straw would be used on the project because of the potential to introduce weeds. Rice straw would be used in non-wetland areas. Native grass straw would be used in wetland areas.

- Collected runoff would be discharged to the same drainages as pre-project conditions wherever possible, to prevent localized increases in runoff.

3.2 Hydrology and Floodplains

Executive Order 11988 for Floodplain Management directs federal agencies to refrain from conducting, supporting, or allowing an action in a floodplain unless it is the only practicable alternative. The FHWA requirements for compliance are outlined in 23 CFR 650 Subpart A. An encroachment into a floodplain is defined as "an action within the limits of the 100-year floodplain," with the 100-year floodplain being defined as "the area subject to flooding by the flood or tide having a one percent chance of being exceeded in any given year." The National Flood Insurance Program produces maps that identify 100-year flood areas based on local hydrology, topology,

precipitation, flood protection measures, and other scientific data. The Federal Emergency Management Agency (FEMA) administers this program.

3.2.1 Affected Environment

The project area lies within the Livermore Valley watershed. The creeks within the project limits are small seasonal drainages. The creeks on the west side of Pigeon Pass drain into Vallecitos Creek, which drains to Arroyo de la Laguna and the San Antonio Reservoir. The creeks on the east side of Pigeon Pass drain into Arroyo del Valle. The average annual rainfall is 51 to 61 cm (20 to 24 in).

FEMA Flood Insurance Rate Maps were used to determine flood zones in the project area. The project corridor is located within Zone C, an "Area of Minimal Flooding."

3.2.2 Impacts

The proposed project would not have an impact on a floodplain. The proposed construction would not adversely affect the drainage or flood potential within the project limits. The increase in impermeable surfaces from construction of this project would have a negligible effect on drainage. No mitigation is required.

3.3 Geology and Soils

3.3.1 Affected Environment

Geologically the project lies within the Coast Range Geomorphic Province of Central California, primarily in the Vallecitos Hills. Terrain in the project area consists of steep rolling hills and open grasslands. Soils in the project area are classified as Positas gravelly loam and Diablo clay according to soil conservation service studies. Slope stability of the underlying soils is a concern for project construction. Positas gravelly loam is considered susceptible to slight to severe erosion. Diablo clay is classified as susceptible to moderate to severe erosion. There has been a history of landslides in the area east of Pigeon Pass.

3.3.2 Impacts

Approximately 16 to 32 ha, (40 to 79 ac) of new right-of-way would be required, depending on the alternative selected. The proposed project would require excavation, grading, roadway construction, and loss of vegetation, all of which result in soil and ground disturbances.

3.3.3 Mitigation Measures

Special design features such as an enhanced erosion control technique (Type B) that utilizes rock bolting with pivoting head anchors attached to threaded steel shafts, steel plates, rope restraints and rock netting will be used in areas that are prone to landslides. Hydro-seeding will be applied following installation to vegetate the stabilized area. Additionally, slopes will be 1:2 with multiple benches or flatter.

3.4 Hazardous Waste/Materials

3.4.1 Affected Environment

Aerially Deposited Lead

Aerially Deposited Lead (ADL) contamination of the soil along the roadway was identified as a possible hazardous waste issue. Historically, lead additives were placed in gasoline. Combustion of gasoline with lead additives resulted in lead particulates, ADL, which over time, accumulated along the State highway system. A site investigation of the project area was conducted by Shaw Environmental, Inc. to evaluate the presence and concentration of ADL. A total of 490 soil samples were collected during this investigation.

Nuclear Research Center

General Electric Vallecitos Nuclear Research Center is located approximately 1380 m (4528 ft) from the start of the project area. The center is an active facility that currently conducts small scale research and development activities on several irradiated fuel sources. Additionally, the facility prepares radioactive material for medical diagnosis, treatment, and research. The facility is licensed and actively regulated by several State and Federal agencies including California Department of Health Services and the Federal Nuclear Regulatory Commission. Soil, water, and air are monitored at various intervals across the entire facility including, at the boundary

of the facility and Caltrans' right-of-way. As a good business practice, annual vegetation samples are taken at the boundary of the facility and Caltrans' right-of-way.

3.4.2 Impacts

Aerially Deposited Lead
After testing, it was determined that soil for the proposed project, treated as a whole, would not be considered a California Hazardous Waste

Nuclear Research Center
There are no identified radioactive waste issues associated with constructing the proposed project immediately adjacent to the General Electric-Vallecitos Nuclear Research Center property lines. The facility is, and has been in compliance with all regulatory requirements and is considered a "good player" by the Department of Health Services. This is consistent with the sampling and analysis conducted in 1997 and 1998 by the Center and the Department of Health Services.

3.4.3 Mitigation Measures

Aerially Deposited Lead
No mitigation is necessary; however, worker health and safety requirements are required. This includes the preparation and implementation of a Lead Compliance Plan, as required by California Code of Regulations, Title 8, Section 1532.1 "Lead". These requirements are outlined in Caltrans Standard Special Provisions. If excess soil is generated by construction of the proposed project, it is recommended that soils 0.3 m (1.0 ft) below existing grade or deeper are selected for off-site reuse or export.

Nuclear Research Center
No mitigation is necessary.

3.5 Air Quality

3.5.1 Affected Environment

The project is located in Alameda County, which is under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). The BAAQMD encompasses the nine San Francisco Bay Counties including, San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Napa, Marin, Southern Sonoma and Southwest Solano

County. The total land area covered is 5600 square miles, with 6.5 million people and 4.5 million cars and light trucks. The San Francisco Bay Area is a large shallow basin surrounded by hills that taper into a series of valleys. The topography gives the Bay Area air basin great potential for trapping and accumulating air pollutants. The attainment status of the BAAQMD is listed in Table 3.1.

Table 3.1 Attainment Status of Bay Area Air Quality Management District

Pollutant		State Attainment Status	Federal Attainment Status
Ozone (O_3)	1 Hour Standard	Non-Attainment	Non-Attainment
	8 Hour Standard	Not Applicable	Unclassified
Particulate Matter (PM_{10})		Non-Attainment	Attainment
Nitrogen Dioxide (NO_2)		Attainment	Attainment
Sulfur Dioxide (SO_2)		Attainment	Attainment
Carbon Monoxide (CO)		Attainment	Attainment
Sulfates		Attainment	Attainment

3.5.2 Impacts

This project is located in Alameda County, which is under the jurisdiction of BAAQMD. BAAQMD is in a federal non-attainment area for ozone. Therefore in order for the project to meet the conformity determination, it must be included in a Federal approved Regional Transportation Plan. The project is in the 2001 Regional Transportation Plan (Ref # 94034), therefore the contributions of emissions are included in the emission budget, and it meets the conformity requirements.

A local carbon monoxide analysis is required for projects that are likely to worsen air quality. To determine if a project is likely to worsen air quality, the criteria in the "Transportation Project-Level Carbon Monoxide Protocol" needs to be examined. If the project passes the criteria, then the project will not worsen air quality and no further analysis is necessary. In summary, this project passes the criteria and will not worsen air quality, therefore it will not have an air quality impact and a carbon monoxide (CO) analysis is not necessary.

3.5.3 Mitigation Measures

Construction of the project will result in the generation of suspended particulate matter. Although the amount of dust generated will result in an impact, the impacts will be temporary, local, and limited to the areas of construction. To minimize the amount of construction dust generated, and because the project is in a state PM_{10} (particulate matter) non-attainment area, dust control practices must be incorporated into the project to mitigate this potential impact. The dust control practices must comply with the current Caltrans' Standard Specifications and the Bay Area Air Quality Management District Regulation 6 – Particulate Matter and Visible Emissions.

3.6 Noise

Federal guidelines for assessing traffic noise are contained in Title 23 of the Code of Federal Regulations, Part 772 (23 CFR 772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise".

Caltrans and the Federal Highway Administration (FHWA) have agreed to the criteria that are outlined in the "Traffic Noise Analysis Protocol, For New Highway Construction and Highway Reconstruction Projects - October 1998". Transportation projects affected by this Protocol are Type I projects. A Type I project is defined in 23 CFR 772 as follows: A proposed Federal or Federal-aid highway project for the construction of a highway on a new location, or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes.

Traffic noise impacts are identified when one of the following occur:

- A substantial noise increase. "Substantial increase" is defined in 23 CFR 772 as follows: "A noise increase is substantial when the predicted noise levels exceed existing noise levels by 12 dBA Leq (h)."

- Noise levels approach or exceed the Noise Abatement Criteria (NAC). "Approach or exceed the Noise Abatement Criteria" is defined in 23 CFR 772 as follows: "A traffic noise impact will also occur when the predicted noise level(s) approach (within 1 dBA) or exceed the Noise Abatement Criteria. (See Table 3.2). The Noise Abatement Criteria for residences is 67 dBA, Leq (h)."

Under FHWA regulations (23 CFR 772), noise abatement must be considered for Type I projects when the project results in a substantial noise increase, or when the predicted noise levels approach or exceed the Noise Abatement Criteria (NAC) (Table 3.2). Noise abatement measures which are reasonable and feasible and that are likely to be incorporated in the project, as well as noise impacts for which no apparent solution is available, must be identified and incorporated into the project's plans and specifications (23 CFR 772.11(e)(1) and (2)).

Table 3.2 Activity Categories and Noise Abatement Criteria (NAC)

Activity Category	NAC Hourly A-Weighted Noise Level, dBA $L_{eq}(h)$	Description of Activities
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 Exterior	Developed lands, properties or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

3.6.1 Affected Environment

The area surrounding the proposed project is primarily rural with a few residences. Short-term noise levels were measured at one location in the project area at the south side of the Ruby Hills Development (see Table 3.3). Noise measurements were made with a Bruel & Kjaer Precision Integrating Sound Level Meter, Type 2236 and a Bruel & Kjaer Sound Level Calibrator, Type 4230 meeting American National Standards Institute requirements for Type 1 sound level meters. The noise level measurements were taken 1.5 m (5 ft) above the ground. Noise levels were taken for

15 minutes and represent a one-hour time period (Leq (h)). The sound level meter was calibrated before and after the measurement, and fitted with a windscreen.

The noise measurement locations were selected to represent the noise environment without the interference of the backyard fences at the noise-sensitive receptors within the project limits. The area surrounding SR 84 is rolling hills and the topography and the earthen berms located at the fence lines of the Ruby Hills Development help shield the noise from the residents.

3.6.2 Impacts

Future Noise Impacts

There are three alternatives being proposed, slightly changing the alignment of SR 84. The area surrounding the Ruby Hills Development is rolling hills. The houses are located on a hillside above SR 84, and the topography of the area provides a natural earthen berm between the houses and the roadway. This earthen berm reduces the line of sight to the roadway and naturally shields the noise.

Traffic noise impacts were identified by using traffic levels predicted for the year 2025 and determining if those noise levels would approach or exceed the noise abatement criteria (NAC) or would be 12 decibels (dBA) or more over existing conditions. Table 3.3 summarizes the traffic noise impacts for the design year conditions for the build and no build scenarios. The only change in the noise environment would be the addition of a climbing lane, and the location of the lanes. Only one of the three alternatives brings the roadway closer to the Ruby Hills Development. It is not a significant change in the alignment. Based on this analysis, the noise level has a potential net increase of 7 dBA, and is well below the NAC of 67 dBA. Therefore this project will not result in adverse noise impacts.

Additionally, one of the project components is to include rubberized asphalt concrete (Type O) in the pavement mixture of the completed roadway. Although not an approved noise mitigation measure, recent studies indicate that rubberized asphalt concrete can reduce traffic noise.

Construction Impacts

Various construction activities for this project will occur over a period of time. During the construction phase of the project, noise from construction activities would

dominate the noise environment in the immediate area. Activities involved in construction would generate noise levels, as indicated in Table 3.4, ranging from 70 to 100 dBA at a distance of 15 m (50 ft). Construction activities would be temporary in nature, typically occurring during normal working hours. Construction noise impacts could be adverse, as nighttime operations or use of unusually noisy equipment could result in annoyance or sleep disruption for nearby residences.

3.6.3 Abatement Measures

Construction noise is regulated by Caltrans Standard Specifications Section 7-1.01I, "Sound Control Requirements". These requirements state that noise levels generated during construction shall comply with applicable local, state and federal regulations, and that all equipment shall be fitted with adequate mufflers according to the manufacturers' specifications.

Adverse construction noise effects can be minimized through the following measures:

- Minimize nighttime, holiday, and weekend work.
- Stationary construction equipment, such as compressors and generators, should be shielded and located as far away as feasible from receptors.
- Construction operations should be placed in locations where noise disturbances would be minimized.
- Hold community meetings to inform area residents of construction work, schedule, and control measures to be taken to reduce impacts.

Table 3.3 List of Measured and Modeled Noise Levels (Sound 2000)

Location	Measured Existing dba Leq(h)	Modeled Existing dBa Leq (h)	2025 No Build Existing dBA Leq(h)	2025 Build Future dBA 80 km/hr Design Leq(h)	2025 Build Future dBA 90 km/hr Design Leq(h)	2025 Build Future dBA 105 km/hr Design Leq(h)	NAC	Greater tha NAC or Significant Increase i Noise Level
Receiver 1	53.0	54	56	60	60	61	67	No
Receiver 2	**	62	65	62	63	64	67	No

** A noise reading was not measured at this receiver, just modeled.

Table 3.4 Construction Equipment Noise Ranges

Type of equipment	Average noise level dBA
Pile Driver	100 @ 15 meters
Scrapers	88 @15 meters
Concrete Truck	82 @15 meters
Dump Truck	80 @15 meters
Front Loaders	80 @15 meters
Backhoes	79 @15 meters
Excavator	76 @15 meters
Bulldozers	71 @15 meters
Compressors	74 @15 meters
Cranes	70 @15 meters
Pumps	70 @15 meters

3.7 Wetlands and Other Waters of the United States

The ACOE and the EPA jointly define wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. The term "other waters of the United States" includes seasonal or perennial waters (creeks, lakes, or ponds) and other types of habitats that lack one or more of the three technical criteria for wetlands (soil, hydrology, or vegetation). The ACOE has authority under Section 404 of the Clean Water Act to regulate activities that could discharge fill or dredge material into, or otherwise adversely modify these resources.

Executive Order 11990 establishes a national policy to avoid adverse impacts on wetlands whenever there is a practicable alternative. The U. S. Department of Transportation (DOT) promulgated DOT Order 5660.1A in 1978 to comply with this direction. On federally funded projects, impacts to wetlands must be identified in the environmental document. Alternatives that avoid wetlands must be considered. If wetland impacts cannot be avoided, then all practicable measures to minimize harm must be included. This must be documented in a specific Wetlands Only Practicable Alternative Finding in the final environmental document.

For the proposed project, "waters of the U. S." are divided into jurisdictional wetlands and "other waters of the U. S." The methodology set forth in the ACOE 1987 Wetland Delineation Manual was used to delineate wetlands within the project limits. Additional information is contained in the Natural Environment Study prepared for this project and is available at the Caltrans, District 3 Office of Environmental Management, 703 B Street, Marysville, CA and at the District 4 Office of Environmental Management, 111 Grand Avenue, Oakland, CA.

3.7.1 Affected Environment

All areas within the project limits that were suspected of having wetland characteristics were delineated in accordance with the Army Corps of Engineers 1987 Wetland Delineation Manual. There are four small seasonal wetlands within the project area.

3.7.2 Impacts

Jurisdictional Wetlands: The proposed project will impact 0.4 hectares (1.0 acres) of jurisdictional wetlands.

Waters of the United States: There will be 0.13 hectares (0 .31 acres) of impacts to other waters. Most are temporary impacts from the addition of culverts. A stockpond will also be permanently filled. The addition of culverts will not change the hydrology of the area. To minimize impacts from culvert installation Caltrans will restore banks to their original condition and revegetate with native species.

Impacts are similar for all three of the build alternatives.

3.7.3 Mitigation Measures

To mitigate the impacts to wetlands Caltrans proposes to mitigate at an appropriate mitigation bank. The mitigation ratio will be determined prior to the permit process with the input of the ACOE.

In addition, Caltrans proposes to recreate the wetland that acts as a breeding pool for California tiger salamander. This site will be partially filled as a result of the new alignment. The existing wetland is located east of a private driveway, south of SR 84, and will be recreated in the general vicinity.

3.8 Vegetation

Oak Woodlands - Oak woodlands are protected under Senate Concurrent Resolution No. 17 (SCR 17). SCR 17 states that "all state agencies, including, but not limited to, those specified in this measure, having land use planning duties and responsibilities shall, in the performance of those duties and responsibilities and in a manner consistent with their respective duties and responsibilities, undertake to assess and determine the effects of their land use decisions or actions within any oak woodlands containing Blue, Engelman, Valley, or Coast Live Oak, that may be affected by the decisions or actions." Under SCR 17, an oak woodland is defined as a five-acre circular area containing five or more oak trees per acre. The California Department of Fish and Game (CDFG) also considers oak woodlands to be a valuable sensitive resource, and requires mitigation for oak tree removal.

Invasive Species/Noxious Weeds - Executive Order 13112 directs federal agencies to prevent and control the spread of invasive species. FHWA requires an analysis of the risk for any federal funded action to cause or promote the introduction or spread of invasive species.

3.8.1 Affected Environment

Nonnative grassland is the dominant vegetation community in the area. Most of this grassland is completely open, but there are some scattered oaks in places. The dominant species within the grassland include slender wild oats (*Avena barbata*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), perennial ryegrass (*Lolium multiforum*), and Medusa-head (*Taeniatherum caput-medusae*). Native and nonnative herbaceous species are also present, as well as patches of creeping wildrye (*Leymus triticoides*) and purple needlegrass (*Nassella pulchra*).

Several seasonally wet areas are located within the project area. These areas sometimes support vegetation which are frequently only found under anaerobic conditions characteristic of wetlands. Vegetation found in the various wet areas include tall flatsedge (*Cyperus eragrostis*), spikerush (*Eleocharis macrostachya*), fringed willow herb (*Epilobium ciliatum* ssp *ciliatum*), spreading rush (*Juncus paten*), rabbit foot grass (*Polypogon monspeliensis*), red willow (*Salix laevigata*), low club rush (*Scirpus cernuus*), and mule fat (*Baccharis salicifolia*). A complete list of all vegetation identified during botanical surveys can be found in the Natural Environment Study, which is available at Caltrans' District 3 office, 703 B Street, Marysville, and at Caltrans' District 4 office, 111 Grand Avenue, Oakland, CA.

Oak Woodlands - Valley oak woodlands, which correspond with the California Native Plant Society's (CNPS) valley oak series, can be found along some of the ephemeral creeks and scattered in the upland nonnative grassland. It is dominated by valley oak (*Quercus lobata*) and includes coast live oak (*Quercus agrifolia*) and California buckeye (*Aesculus californica*). The woodlands interspersed in the upland are of a lower density than the riparian and are typical of oak woodlands that have a nonnative grassland understory.

Invasive Species/Noxious Weeds - Some exotic (nonnative) species are considered aggressive and invasive. The California Exotic Pest Plant Council (CalEPPC) maintains a list that categorizes the severity of the invasive species. List A, with its two subcategories A-1 and A-2, contains plants which are considered the most

invasive wildland pest plants. They are considered aggressive invaders that displace natives and disrupt natural habitats. Plants in subcategory A-1 are widespread, plants in A-2 are less widespread (regional pests). List B plants are less invasive than List A plants, spread less rapidly, and cause less disruption. Red List plants are localized but have the potential to spread explosively. The following nonnative plants in the study area are on CalEPPC's A or B Lists: yellow star-thistle (*Centaurea solstitialis*) (A-1), fennel (*Foeniculum vulgare*) (A-1), Medusa head (*Taeniatherum caput-medusae*) (A-1), red brome (*Bromus madritensis ssp. rubens*) (A-2), fig (*Ficus carica*) (A-2), pennyroyal (*Mentha pulegium*) (A-2), Mediterranean linseed (*Bellardia trixago*) (B), black mustard (*Brassica nigra*) (B), Italian thistle (*Carduus pycnocephalus*) (B), bull thistle (*Cirsium vulgare*) (B), poison hemlock (*Conium maculatum*) (B), olive (*Olea europaea*) (B), and Harding grass (*Phalaris aquatica*) (B). None of the plants in the project area are on CalEPPC's red list. A few species in the project area are on CalEPPC's list for which current information does not adequately describe the nature of its distribution, invasiveness, or threat to wildlands: short pod mustard (*Hirschfeldia incana*), cherry plum (*Prunus cerasifera*), and purple-top vervain (*Verbena bonariensis*). The following nonnative grasses located in the study area are on CalEPPC's preliminary list of annual grasses that are abundant and widespread in California and pose significant threats to wildlands: slender wild oats (*Avena barbata*), ripgut brome (*Bromus diandrus*), and Italian ryegrass (*Lolium multiflorum*).

3.8.2 Impacts

Oak Woodlands - The proposed project will impact approximately 1.8 ha (4.4 ac) of riparian oak woodland and 0.8 ha (1.9 ac) of upland oak woodland.

Invasive Species/Noxious Weeds - The proposed project has the potential to introduce or spread invasive plant species and noxious weeds with the clearing, grading, and soil-moving operations associated with roadway construction.

3.8.3 Mitigation Measures

Where possible, efforts should be made to avoid the removal of native trees within the project limits. All trees to be avoided would be protected throughout the construction period by special fencing. These trees would be marked on project plans and in the field.

Oak Woodlands – Mitigation for loss of oaks is consistent with SCR 17, as well as CDFG's consideration of oak woodlands as a sensitive resource. Oak woodlands will be replaced, in kind, on site where room will allow. The remaining acreage will be replaced offsite at a mitigation bank or other suitable location in the vicinity. Avoidable oak woodlands will be fenced off and designated as environmentally sensitive areas (ESAs).

Invasive Species/Noxious Weeds - The following revegetation measures for all disturbed soils would reduce the potential to introduce or spread invasive plant species and noxious weeds from or into the project area:

- The contract specifications for permanent erosion control would require the use of California native forbs and grass species, from the same elevation and geographic area as the project site.
- All areas disturbed by construction would be treated with a seed mix comprised of local native grasses and forbs.
- Soils would be amended with compost containing long-term soil nutrients and slow-release organic fertilizers to provide nutrients over the first year.
- Mulches used on the project would be from source materials that would not introduce exotic species. No wheat or barley straw would be used on the project because of the potential to introduce weeds. Rice straw would be used in non-wetland areas. In wetland areas, only native grass straw would be used.

3.9 Special Status Species

Special status species are plants, animals, and fish that are considered rare, threatened, or endangered by local, state, or federal resource conservation agencies. These agencies include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), and the California Native Plant Society (CNPS). These agencies protect and manage special status species and potential special status species under the federal Endangered Species Act, California Endangered Species Act, California Fish and Game Code, and the California Native Plant Protection Act.

3.9.1 Affected Environment

The determination of the Biological Study Area (BSA) was a joint effort by the PDT to ensure that all areas impacted by construction activities would be included during technical studies. It is expected that the presence of equipment and noise may cause a disturbance to species occupying areas beyond the actual construction footprint. For this reason, the BSA extends beyond the limits of ground disturbance. Care was taken to include areas that could be potentially impacted indirectly but without incorporating an unreasonably large study area. General field surveys of the BSA were conducted by Caltrans biologists to assess existing natural resources and identify habitat types, potential wetlands, factors indicating the potential presence of sensitive species (threatened, endangered and species of concern), and the need for in-depth studies.

Several literature references were consulted to determine the potential presence of federal and state listed endangered and threatened species, species of concern, and other sensitive biological resources within the BSA. These references included 1) the California Natural Diversity Database (CNDDB) 7.5 minute quadrangles for Livermore, La Costa Valley, Milpitas, Dublin, Mendenhall Springs, Niles, Altamont, and Diablo (CDFG); 2) the Federal Threatened and Endangered Species lists for La Costa Valley and Livermore quadrangles (USFWS); and 3) other published and nonpublished literature.

3.9.1.1 Birds

Western burrowing owl (*Athene cunicularia hypugaea*): Federal species of concern and state species of concern. The burrowing owl is a small, ground-dwelling owl that inhabits open spaces. Burrowing owl habitat is present within the BSA, and assumed to be occupied. One owl pellet containing insect and small mammal remains was found at the entrance of a ground squirrel burrow.

Loggerhead shrike (*Lanius ludovicianus*): Federal species of concern and state species of concern. The loggerhead shrike is a songbird that feeds more like a bird of prey. Due to its unique behavior of impaling its captured prey on thorns, twigs, and barbed wire, it is able to consume larger prey than is typical for a songbird of its size. Their diet consists of small mammals, birds, lizards, snakes, frogs and insects. These birds breed and winter in California. Sometimes they build nests in edge habitats along roadways.

A loggerhead shrike was observed during a field study on June 27, 2002 at the intersection of SR 84 and the Mullenax driveway. Also, signs of their presence in the form of impaled insects were found on the right-of-way barbed wire fence at the west end of the project area.

Red-tailed hawk (*Buteo jamaicensis*): Protected under the Migratory Bird Treaty Act. There is a red-tailed hawk nest located just outside the project area, within 46 m (150 ft) of the proposed alignment. Field observations in 2002 proved it to be active. It is not known if it was active in 2003.

3.9.1.2 Mammals

San Joaquin kit fox (*Vulpes macrotis mutica*): Federal endangered and state endangered. The San Joaquin kit fox is one of eight recognized subspecies of kit fox. San Joaquin kit foxes are nocturnal. They use dens that have been excavated in loose soil, often using existing ground squirrel dens that they enlarge. Dens are normally 20 to 25 cm (8 to 10 in) in diameter and are taller than they are wide. They will also take advantage of man-made structures such as culverts when natural dens are in short supply.

Surveys showed that suitable kit fox habitat appears to be abundant within the BSA, and is contiguous within a 10-mile radius of the project. There is an abundance of ground squirrels, which provide dens, and a prey base. Several squirrel dens appear to have been enlarged by another animal, possibly a kit fox. Although the closest kit fox sighting is approximately 8 km (5 mi) from the project, there are no obvious natural barriers that would prohibit kit fox movement within the radius. The preponderance of available evidence supports the determination that the species is likely to be present in the BSA affected by the action and that additional survey data is not likely to change the presence determination or to benefit the species.

Vernal Pool Crustaceans

Vernal pool fairy shrimp (*Branchinecta lynchi*): Federal threatened. The vernal pool fairy shrimp occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools. During reproduction, the female either drops her eggs to the bottom or carries her eggs in the brood sac until she dies and sinks to the bottom. These eggs (cysts) dry up with the vernal pool and stay in a resting state until certain stimuli, rain for instance, induce hatching. The soil in the bottom of an occupied pool may contain viable cysts that are many years old.

Caltrans hired URS, a private consulting firm, to conduct back-to-back dry and wet season surveys in 2002/2003 in accordance with the USFWS fairy shrimp protocol. A total of five sites were sampled. Dry sample surveys revealed two cysts at one site which had large polygon morphology characteristic of *B. lynchi*, *B. coloradensis*, *B. conservatio*, *B. longiantenna*, *B. sandiegonensis*, *B. mesovallensis*, *B. lindahli*, and the undescribed *Branchinecta* known as "mountain fairy shrimp". Wet sample surveys in 2002/2003 did not discover any adult *Branchinecta* species at any of the sampling locations. According to URS, habitat associations and geographic ranges indicate that the cysts most likely came from *B. lynchi*. Therefore, vernal pool fairy shrimp are present within the study area.

California linderiella fairy shrimp (*Linderiella occidentalis*): Federal species of concern. California linderiella are freshwater crustaceans, which inhabit clear to tea-colored water in seasonal ponds. Their life cycle revolves around fluctuations in their habitat such as the presence or absence of water, temperatures and levels of dissolved oxygen. During reproduction, cysts settle to the bottom of the pond and remain in the mud after the water body dries. Once the water returns to the pond and conditions are favorable, the cysts hatch. Fairy shrimp are a source of food for the California tiger salamander. California linderiella fairy shrimp were discovered at one site during dry and wet season surveys.

3.9.1.3 Amphibians and Reptiles

California red-legged frog (*Rana aurora draytonii*): Federal threatened, state species of concern. A 24-ha (60-ac) mitigation site for red-legged frog (RLF) and California tiger salamander is adjacent to the east end of the project area, north of SR 84. The site was established by Signature Homes to mitigate impacts caused by the construction of the Ruby Hills and Vineyard Estates subdivisions. The site consists of a series of created ponds connected by drainages, and the surrounding upland habitat. Two of these ponds lie within the BSA but well outside the project footprint. The pond nearest SR 84 dries completely during late summer, the other pond maintains some water all year. According to Janice Gann, of the Department of Fish and Game, RLF are present within these ponds. The URS consultant also detected RLF egg masses in one of the ponds outside the project footprint while conducting fairy shrimp surveys. An unnamed ephemeral creek runs parallel to the south side of SR 84, from the middle to the east end of the project. The creek's substrate is a mud/cobble mix with abundant detritus, potholes and shallow pools. With the exception of a few small open areas, the creek is heavily wooded. Although the creek does not flow during the summer months, there are active springs that keep large

portions of the creek moist, and in some areas provide shallow pools. The heavy shade also contributes to the moist environment. The hydrology of this creek does not support breeding frogs, but may provide suitable summer habitat. It is possible that some of the frogs inhabiting the mitigation pond which dries up may move, via crossing the highway or through existing culverts, to the moist areas in the creek for summer refuge.

California tiger salamander (*Ambystoma californiense*): Federal proposed threatened and state species of concern. The distribution of the California tiger salamander (CTS) is restricted to the Central Valley of California and lower elevations to the west. A 24-ha (60-ac) mitigation site for RLF and CTS is near the east end of the project, north of SR 84. The site, consisting of a series of ponds connected by drainages, was established by Signature Homes to mitigate impacts caused by the construction of the Ruby Hills and Vineyard Estates subdivision. Two of these ponds lie within the BSA but well outside the project footprint. A URS consultant observed larval salamanders at this site, as well as at a seasonal pool located south of the SR 84 toe of slope. Potential habitat appears to exist in a seasonal stockpond located south of SR 84 on private property, although no larvae were observed. According to CDFG's California Natural Diversity Database there are documented occurrences of CTS nearly the entire length of the project area, therefore, all upland, riparian, and bodies of water within the project area are considered CTS habitat.

Western pond turtle (*Clemmys marmorata*): Federal species of concern. The northwestern (*Clemmys marmorata marmorata*) and southwestern pond turtle (*Clemmys marmorata pallida*) are subspecies of the western pond turtle. Although the stock ponds adjacent to and within the BSA, appear to be suitable habitat, no western pond turtles (WPTs) were found during numerous field surveys of aquatic and upland areas by either the Caltrans biologist or the consultant. Knowing the nearest documented sighting is only approximately 3.2 km (2 mi) away, it is possible that WPTs are present despite the lack of visual observations during field visits.

3.9.2 Impacts

3.9.2.1 Birds

Western burrowing owl: The proposed action will have temporary and permanent direct effects to western burrowing owls. Ground disturbance including grading, filling, and excavating will occur over the entire length of the project. This type of ground disturbance has the potential to cause mortality to individuals occupying the

area. Burrowing owls could be crushed or buried alive by heavy equipment and earth moving. Other direct effects caused by construction activities include possible temporary disruption of foraging, disruption or complete loss of reproduction, harassment from increased human activity, and permanent and temporary loss of habitat.

Loggerhead shrike: The proposed action will have temporary and permanent direct effects to the loggerhead shrike. Direct effects to loggerhead shrikes include disruption of breeding, destruction of nests, and mortality to nestlings. The temporary increase in noise and presence of human activity could interfere with foraging and harass individuals. Because these birds sometimes build nests in edge habitats near roadways, they are at greater risk of being disturbed during construction. Individuals may be forced to search for nesting habitat in areas that are already occupied, where they will have to compete even harder for fixed resources. Heavy use of barbed wire fence for foraging was evident within the BSA, and a temporary loss of the fence could make foraging more difficult. Approximately 6.9 ha (17 ac) of foraging habitat would be permanently lost due to the new alignment.

Red-tailed hawk: No impacts with mitigation and avoidance measures.

3.9.2.2 Mammals

San Joaquin kit fox: The proposed action will have permanent and temporary direct, and indirect effects to the San Joaquin kit fox. Approximately 7 ha (17.3 ac) will be permanently lost to the new alignment. Another 25 ha (61.9 ac) will be temporarily disturbed as a result of construction related activity. Ground disturbance including grading, filling, and excavating will occur over the entire length of the project. This type of ground disturbance has the potential to cause mortality to individuals occupying the area. Kit fox could be crushed or buried alive by heavy equipment and earth moving. Other direct effects caused by construction activities include possible disruption of foraging, disruption or complete loss of reproduction, harassment from increased human activity, and permanent and temporary loss of shelter. Since kit fox are nocturnal, if construction is performed at night associated lighting could increase all of the above effects, and possibly increase predation. Indirect effects may include an increase in mortality as the foxes will have to cross a wider highway, in turn increasing their chances of being hit by traffic. Portions of the original road will remain intact after completion of the proposed action. This will mean the fox must, in some areas, cross two roads to reach adjacent habitat. Although this may seem to pose an additional threat, the old road will serve only as an access road to a local

rancher's livestock pasture. It is likely to receive virtually no traffic during the night, and therefore would not pose a barrier to crossing.

3.9.2.3 Vernal Pool Crustaceans

Vernal pool fairy shrimp: The proposed action will have direct effects to vernal pool fairy shrimp. Approximately 84% (0.21 ha [0.52 ac] of a 0.25-ha [0.61-ac]) pool occupied by vernal pool fairy shrimp is slated to be filled for the construction of the new alignment. This action will result in mortality to all individuals living in the portion of the pool that is slated for fill, and a loss of habitat for the species as a whole. By partially filling the pool, the crucial components of the remaining portion, such as size, temperature, and hydrology, may be altered such that the remaining undisturbed portion of the pool no longer functions as fairy shrimp habitat. Reducing the pool's size and concentrating the population into such a small area could potentially increase predation to a point which the species could not sustain itself. The USFWS considers an entire pool to be directly impacted if any part of it is destroyed. Therefore, 0.25 ha (0.61 ac) of fairy shrimp habitat will be lost.

California linderiella fairy shrimp: The population of California linderiella fairy shrimp will suffer the same impacts, including cumulative, that were outlined for the cohabiting vernal pool fairy shrimp.

3.9.2.4 Amphibians and Reptiles

California red-legged frog: The proposed action will have permanent and temporary direct, and permanent indirect effects to the red-legged frog (RLF). Approximately 1.8 ha (4.4 ac) of RLF riparian summer habitat will be removed during construction. Areas of RLF habitat that are avoidable will be fenced and protected as an Environmentally Sensitive Area (ESA). No breeding habitat will be affected. Individual frogs occupying the affected habitat run the risk of being crushed or buried by earth moving activities. Those that do survive will suffer permanent and temporary (during construction activity) loss of habitat, possible temporary disruption of foraging, and harassment from increased human activity. Since frogs migrate to breeding ponds and breed outside of the construction season, and no breeding habitat will be impacted, disruption or loss of reproduction among surviving frogs is not expected. However, at certain times during construction it is possible that frogs leaving the breeding ponds north of SR 84 to seek summer habitat south of SR 84 may be impeded due to construction activities. Frogs would be able to use summer habitat north of SR 84 in the mitigation preserve. Summer habitat, including riparian

corridors, ponds, mud cracks, and mammal burrows in the preserve are abundant and completely protected from construction activities.

Permanent indirect effects come from increased impervious surfaces caused by the additional pavement. The addition of impermeable surfaces increases roadway run-off contaminated with chemicals associated with vehicles (i.e., gasoline and oil), and silt, which may lead to water quality degradation. Also, having to cross a wider highway will increase their chances of being hit by traffic.

California tiger salamander: The proposed project will have permanent and temporary direct effects and permanent indirect effects to the California tiger salamander (CTS). Approximately 7.7 ha (19.1 ac) of CTS habitat, including 0.25 ha (0.61 ac) used for breeding, will be permanently lost to the new and wider alignment. Construction related activities will temporarily disturb 27.5 ha (68 ac), including 0.02 ha (0.05 ac) used for breeding. The impacted habitat consists of riparian and upland aestivating habitat, and breeding habitat. Individual salamanders occupying the affected habitat run the risk of being crushed or buried by earth moving activities. Those that do survive will suffer permanent and temporary loss of habitat (related to temporary construction activity), possible temporary disruption of foraging, and harassment from increased human activity. Permanent indirect effects come from increased impervious surfaces caused by the additional pavement. The addition of impermeable surfaces increases roadway run-off contaminated with chemicals associated with vehicles (i.e., gasoline, oil), and silt, which may lead to water quality degradation. Caltrans will work with the CDFG in an effort to find and relocate CTS one year prior to construction

Western pond turtle: The proposed action will have permanent and temporary direct, and permanent indirect effects to the WPT. Potential direct effects to WPTs include injury and mortality to individuals in the direct path of ground disturbance activities taking place within the upland areas. Large equipment and earth moving activities can crush or bury WPTs alive. This mortality includes the destruction of occupied nests. Those that do survive will suffer permanent and temporary (during construction activities) impacts, loss of upland habitat, possible disruption of foraging, and harassment from increased human activity. Permanent indirect effects come from increased impervious surfaces caused by the additional pavement. The addition of impermeable surfaces increases roadway run-off contaminated with chemicals associated with vehicles (i.e., gasoline, oil), and silt, which may lead to water quality degradation. Another indirect effect may include a possible increase in

mortality as the turtles will have to cross a wider highway, in turn increasing their chances of being hit by traffic. Portions of the original road will remain intact after completion of the proposed action. This will mean the WPTs must, in some areas, now cross two roads to reach adjacent habitat. However the old road will serve only as an access road to a local rancher's livestock pasture and receives very little traffic, it is not expected to pose a significant barrier to WPTs trying to cross.

3.9.3 Mitigation Measures

Caltrans and FHWA have completed formal consultation with the USFWS for federally listed species, pursuant to Section 7 of the Federal Endangered Species Act. Mitigation measures for these species are contained in the USFWS's Biological Opinion which may be found in Appendix E.

3.9.3.1 Birds

Western burrowing owl: Caltrans will work with the CDFG to implement a plan that will minimize direct effects to burrowing owls. This plan may include, but is not limited to, pre-construction surveys, monitoring, relocation, nest salvage, or exclusion of owls from burrows. Burrowing owls use the same habitat as kit fox, and the upland constituent of RLF and CTS habitat. Any land set aside for these species, within the range of the burrowing owl, would also benefit the future survival of the owls, and help minimize the negative effects caused by the proposed action.

Loggerhead shrike: Avoiding construction during the breeding season (spring through summer) is not feasible. The typical construction season runs from mid March to mid October, and the proposed project is too large to restrict work to only a couple of months during that season. Such a restriction would add years to construction, or render the project unbuildable. One method of minimizing mortality and reproduction loss would be to establish a work window for clearing and tree removal to occur outside the nesting period. To require this during the fall and winter months would expose threatened and endangered species addressed in this document to greater risk during their breeding seasons. Instead, preconstruction surveys will be conducted to ensure active nests are not destroyed. Barbed wire fence will be replaced at the completion of construction. Caltrans is planning to revegetate a portion of the BSA with an oak woodland. When mature, this woodland will increase edge habitat and create nesting sites for the shrike.

Red-tailed hawk: In order to avoid disturbance to an active nest the following provisions shall be implemented:

- Any work necessary within 152 m (500 ft) of the known nest site shall begin between March 1st and March 15th. Once work commences there shall be no cease in work greater than 24 hours for as long as the work is necessary, or until May 15th whichever comes first.

- If hawks nest at the site any time prior to or during the construction season a biological monitor, approved by Caltrans, shall be retained by the contractor to monitor the nest during the time(s) that construction activities are taking place within 400 m (0.25 mi) of the nest. The frequency and duration of the monitor will be determined at that time by the Caltrans project biologist.

- No jack hammering, pile driving, blasting, or other activity which is suspected to cause noise levels in excess of typical earth moving activities (clearing, grubbing, excavating, etc.) shall be performed within 400 m (0.25 mi) of the active nest site. If it is found that activities are causing stress and/or the potential of nest abandonment, it may be necessary to cease activity until a plan can be developed between the parties involved that would avoid causing abandonment, or until the young fledge, depending on the circumstances.

3.9.3.2 Mammals

San Joaquin kit fox: Caltrans will divide the 132 acres of compensation habitat for the San Joaquin kit fox and the California tiger salamander by purchasing 80 credit acres for the California tiger salamander. For the remaining 52 acres, Caltrans will set aside $650,000 (52 x $12,500) until a FWS approved mitigation bank becomes available. At that time, Caltrans will expend the $650,000 to purchase credits at the bank.

Twelve culverts will be installed throughout the project. These structures, although not specifically designed for the kit fox, will provide a safe method of crossing the new highway.

In addition, there are two structures being added that will provide safe undercrossings for foxes year round. The proposed highway will cross over two driveways that provide access for a local rancher to his livestock pastures. In order to maintain this access, two large culvert structures will be installed. Each structure will be located adjacent to a creek, so will be more apt to be found by kit foxes based on their

tendency to use drainages for corridors. Their location, large size, and year round access should provide a safe, useable area for crossing.

3.9.3.3 Vernal Pool Crustaceans

Vernal pool fairy shrimp: Caltrans agrees to mitigate for vernal pool fairy shrimp impacts by securing 2.06 acres of vernal pool fairy shrimp habitat. Of that amount, 1.36 acres will be in the form of preservation, and .7 acre will be in creation. Caltrans is currently looking at options for mitigation, which include, but are not limited to, mitigation banks, conservation easements, and in-lieu funds, or a combination of options. Caltrans will ensure that whatever mitigation approach(es) is/are chosen will meet the FWS's approval and the appropriate measures will be taken to guarantee protection in perpetuity.

California linderiella fairy shrimp: The proposed mitigation for the vernal pool fairy shrimp will also minimize the effects to California linderiella fairy shrimp.

3.9.3.4 Amphibians and Reptiles

Red-legged frog: Caltrans will purchase 25 acres of Californa red-legged frog habitat. Twenty-five of the 80 tiger salamander credits purchased at Ohlone Conservation Bank will be purchased as tiger salamander/red-legged frog multi-species credits.

Twelve drainage culverts, and two driveway culvert undercrossings will be installed throughout the project. These structures, although not specifically designed for RLF, will provide a safe method of crossing the new highway. These culverts will minimize the possible increased mortality associated with crossing a wider highway. To minimize disturbance during the breeding migration and reduce the risk of mortality there shall be no ground disturbing activities between October 31 and March 1, outside the limits of the established road bed. Adverse effects to water quality will be avoided by implementing temporary and permanent Best Management Practices outlined in section 7-7.01G of Caltrans' Standard Specifications.

California tiger salamander: To avoid direct mortality to breeding adults and juveniles using the affected breeding pool, construction will be restricted to a period after the pool has completely dried (normally by mid July). Also, to minimize disturbance during the breeding migration and reduce the risk of mortality there shall be no ground disturbing activities between October 31 and March 1 outside the limits of the established road bed. Since CTS migrate to breeding ponds and breed outside of the construction season, disruption of the process is not expected. Dispersal of juveniles

occurs by May or June, so any construction taking place during that time may limit and complicate juvenile dispersal to the uplands. Those juveniles using the ponds on the mitigation site north of SR 84 who may want to disperse into the upland south of SR 84 may be impeded due to construction activities. They may be forced to find summer habitat north of SR 84 in the mitigation preserve established by Signature Homes. Summer habitat, including mammal burrows in the preserve are abundant and completely protected from construction activities.

Caltrans will divide the 132 acres of compensation habitat for the San Joaquin kit fox and the California tiger salamander by purchasing 80 credit acres for the California tiger salamander. For the remaining 52 acres, Caltrans will set aside $650,000 (52 x $12,500) until a FWS approved mitigation bank becomes available. At that time, Caltrans will expend the $650,000 to purchase credits at the bank.

Twelve culverts, and two driveway culvert undercrossings will be installed throughout the project. These structures, although not specifically designed for the CTS, will provide a safe method of crossing the new highway. These culverts could minimize the possible increased mortality associated with crossing a wider highway. Since there are drainage culverts proposed at both vegetated riparian corridors, and also in the upland areas, this will likely increase the chances that CTS will find them during any point-to-point movements. Modifications to culverts, (fencing, culvert substrate, etc.) that would encourage use by amphibians is currently being investigated. Intentions are that the culverts will be used by multiple species so care must be taken to ensure that a modification for one species is not detrimental to another. Adverse effects to water quality will be avoided by implementing temporary and permanent Best Management Practices outlined in section 7-7.01G of Caltrans' Standard Specifications.

Western pond turtle: Because CTS, RLF, and WPT have such similar habitats, any land set aside for those species, within the range of the WPT, would benefit the future survival of the species, and help compensate for the negative effects caused by the proposed project. Twelve culverts and two driveway culvert undercrossings will be installed throughout the project. These structures, although not specifically designed for the WPT, will provide a safe method of crossing the new highway. Spacing between the proposed culverts ranges from 26 m (85 ft) to 450 m (1,480 ft). These culverts will minimize the possible increased mortality associated with crossing a wider highway. Effects caused by poor water quality will be avoided by

implementing temporary and permanent Best Management Practices outlined in section 7-7.01G of Caltrans' Standard Specifications.

3.10 Parks, Recreational Areas, and Wildlife/Waterfowl Refuges

There are no parks or refuges immediately adjacent to the project area. The Sunol Regional Wilderness is the closest park, approximately 6.4 km (4 mi) south of the project area. Since there would be no impacts to parks, recreational areas, or wildlife refuges, no mitigation is required.

3.11 Land Use, Planning, and Growth

3.11.1 Affected Environment

The existing corridor travels through land use areas that are designated Large Parcel Agriculture, Resource Management, and Lands within City Limits (Urban Growth Area). "Large Parcel Agriculture" areas permit agricultural processing facilities and limited agricultural services. "Resource Management" areas require a minimum parcel size of 100 acres. The eastern portion of the existing roadway borders the Ruby Hills Development, an upscale residential community. This section of SR 84 is considered to be part of the "Lands within City Limits" (Urban Growth Area), according to the East County Area Plan.

3.11.2 Impacts

The project would require the acquisition of 16 to 32 ha (40 to 79 ac), depending on the alternative, of land adjacent to the existing alignment. The land acquired would primarily be grazing land. The proposed project is consistent with the policies contained in the Alameda County General Plan. Since the project would not increase highway capacity, it is not expected to support population growth. No mitigation is required.

3.12 Community Impacts (Social, Economic) and Environmental Justice

3.12.1 Affected Environment

This section of SR 84 carries primarily commuter traffic, and acts as a connector for motorists traveling from Interstate 580 to Interstate 680. At the east end of the project area is the City of Livermore, with a population of 74,000. North of the project is the City of Pleasanton, with 64,000 people. The majority of the population (80%) is in Management/Professional or Sales and Office occupations.

Residential – Residences in the project area include the Ruby Hills gated community at the east end of the project area, and one residence close to the road south of SR 84. (See Figure 3.1 for proximity to SR 84)

Business - Businesses near the project area include Kalthoff Vineyards and Crystal Image Farms, an equestrian facility. No businesses will be impacted by this project.

Demographics – Based on the U.S. Census Bureau 2000 census, the racial and ethnic composition within the cities of Pleasanton and Livermore has a lower percentage of minorities than Alameda County as a whole. The median household income for the city of Livermore is well above the average for both Alameda County and California as a whole. (See Tables 3.5 and 3.6)

Table 3.5 Racial and Ethnic Composition

Population Groups (by percentage)	Alameda County	Livermore	Pleasanton
White	48.8	81.9	80.4
African American	14.9	1.6	1.4
American Indian	0.6	0.6	0.3
Asian	20.4	5.8	11.7
Hispanic	19.0	14.4	7.9
Total Population	1,443,741	73,345	63,654

Source: U.S. Census Bureau, Census 2000.

Table 3.6 Income Levels

Income in 1999	Alameda County	Project Area Livermore	Project Area Pleasanton	California
Median Household Income	$55,946	$75,322	$90,859	$47,493
Per Capita Income	$26,680	$31,062	$41,623	$22,712
Persons below poverty, percent, 1999	11%	Not Available for City	Not Available for City	14%

Source: U.S. Census Bureau, Census 2000.

3.12.2 Impacts

Right-of-Way – Right-of-way acquisition would be required for construction of the project and consists mostly of unimproved agricultural land. Two of the affected parcels are improved with vineyards. One full take of an agricultural property with a residence would be required. Property owners would be compensated the fair market value for any land or improvements acquired by Caltrans. (See table 3.7 for impacts)

Table 3.7 Right-of-Way Impacts

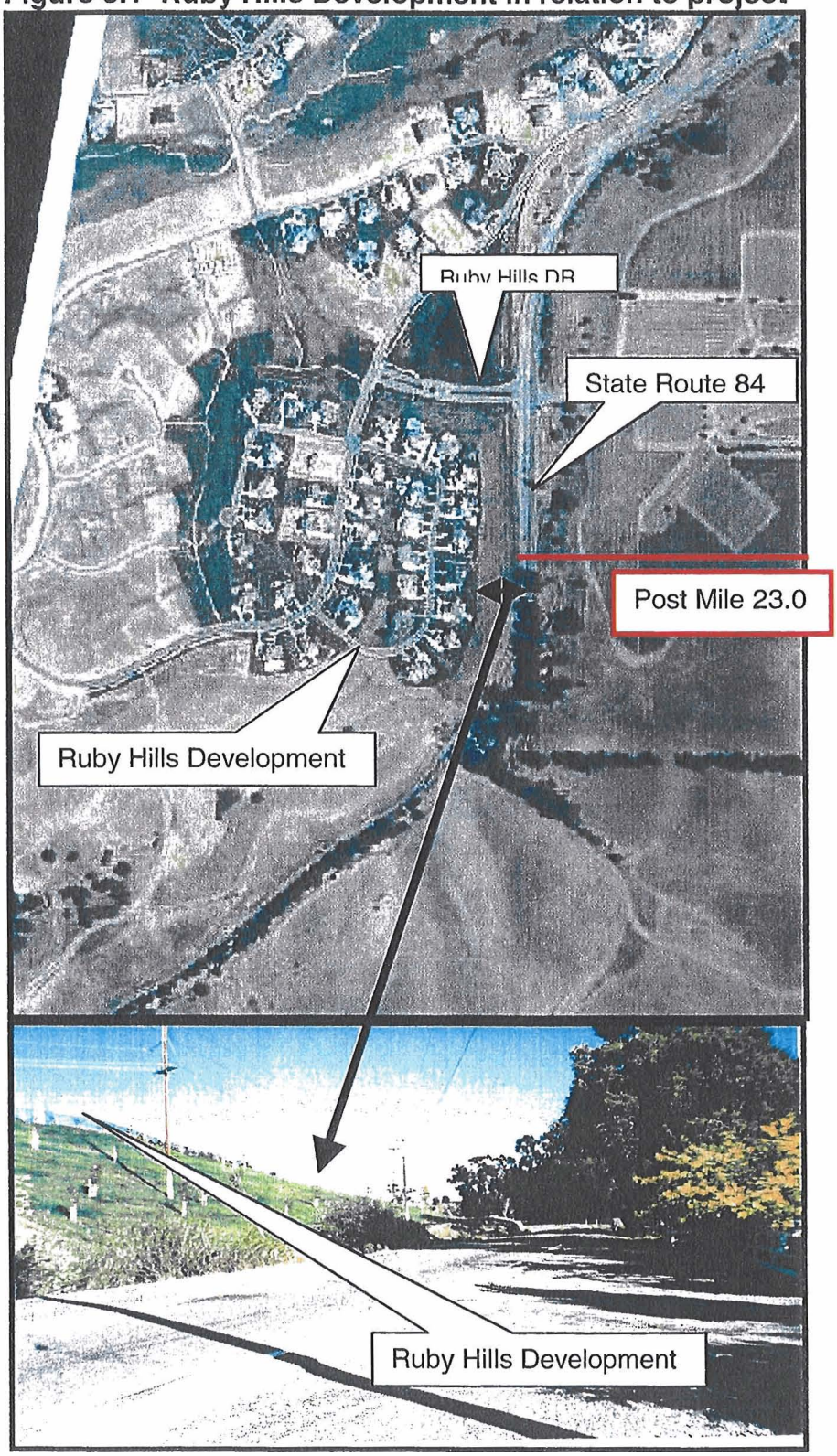
	Design Speed Alternative		
Impact	**80-km/h**	**90-km/h**	**105-km/h**
Parcels impacted	9	10	10
Relocations required	0	1	1
Hectares of new right-of-way	16.36	27.13	32.06
Acres of new right-of-way	40.43	67.04	79.22

Environmental Justice – The demographic analysis for the area surrounding the project indicates that it is in a higher income area than average. The proposed project would not result in disproportionately high health or environmental effects on minority or low-income populations. The project is considered to be consistent with the objectives of Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low Income Populations).

3.12.3 Compensation

Property owners would be compensated the fair market value for any land or improvements acquired by Caltrans. Relocation assistance will be provided in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Refer to Appendix C for further information.

Figure 3.1 Ruby Hills Development in relation to project



3.13 Utilities/Emergency Services

The project will require the relocation of gas, electric and telephone facilities. There are no water distribution facilities located in the project limits. The project requires relocation of approximately 300 m (984 ft) of 600-mm (24-in) diameter natural gas transmission pipeline. The project also requires the relocation of approximately 1100 meters (3610 ft) of overhead electrical transmission and distribution lines. Caltrans will closely coordinate with utility companies to ensure minimum disruption of service to customers in the project area.

No emergency services would be adversely impacted by construction of the project. During construction, Caltrans will coordinate with appropriate emergency response agencies to ensure adequate response times. After completion, the proposed project would result in improved conditions for fire protection, law enforcement, and other emergency response services along SR 84.

3.14 Bicycle Facilities

State Route 84 between I-680 and I-580 is a conventional highway. All conventional highways and expressways are open to bicycle travel, except where prohibited. Therefore, SR 84 in the project area is open to bicycle travel.

Bicycle travel is expected to improve with the construction of wider shoulders and curve corrections. Additionally, with the 90-km/h (55-mph) Alternative the current roadway would be relinquished as a frontage road, which could provide an improved route for bicyclists.

3.15 Visual/Aesthetics

Caltrans Office of Landscape Architecture conducted studies of the proposed project area to identify possible scenic resources and potential visual quality impacts, as per Caltrans standards. The methods used to assess the visual impacts of the proposed project are those set forth in the report, "Visual Impact Assessment for Highway Projects "published by the U.S. Department of Transportation Federal Highway Administration. Landscape character and levels of visual quality were then determined for both pre-and post-project conditions. The analysis considered views of the road from surrounding areas as well as views from the road experienced by motorists who would be traveling on State Route 84.

3.15.1 Affected Environment

Traveling east on SR 84 starting at the beginning of the project, KP 33.3 (PM 20.7) the terrain is pastoral with rolling hills. The land use along this stretch consists of grazing land, small farms, sparsely scattered residences and a few private and public equestrian facilities (Crystal Image Farms). Most of this development sits back from the highway and is not highly visible. The highway facility in this section lies between distant rolling hills in a valley terrain. As the roadway ascends out of the valley it becomes rather steep in areas. Segments of the road abut up against cut slopes of rolling hills on the north side and have steep drop offs on the south side. These drop off segments open up the highway to an extensive view-shed. Other portions of the highway are depressed where the road travels between cut slopes. The corridor past Pigeon Pass descends along a dense riparian habitat that borders the southern edge of the corridor. Continuing east, the terrain changes from rural to a more urban environment. The more urban part of SR 84 has the Ruby Hills Development on the north side and the Kalthoff Vineyards and a single residence on the south side.

Traveling west from approximately KP 37.0 (PM 23.0), the corridor begins to ascend through oak woodlands with riparian vegetation and a creek paralleling the south side of the existing SR 84. The north side of the corridor is rolling hills covered with native grasslands. This section of the corridor is narrow, winding, and steep. At the crest of the corridor, known as Pigeon Pass, expansive views of rolling hills, grazing/agricultural land, glimpses of the San Antonio Reservoir, the foothills of the Sunol Regional Wilderness, and the Apperson and Wauhab Ridge can be seen.

3.15.2 Impacts

Within the immediate project area, the landscape exhibits a high degree of vividness, intactness, and unity. Additionally, the scenic resources of the area provide a uniqueness and quality due to their view-sheds, the natural landscape of the surrounding rolling hills, and the riparian vegetation and creek that parallel portions of the existing roadway.

After giving consideration to the existing roadway and environment, the alternatives were considered to help determine future impacts to the scenic resources and visual quality of the project's area. Because the alternatives only vary slightly in location

Figure 3.2 Existing view of SR 84 looking east towards Ruby Hills

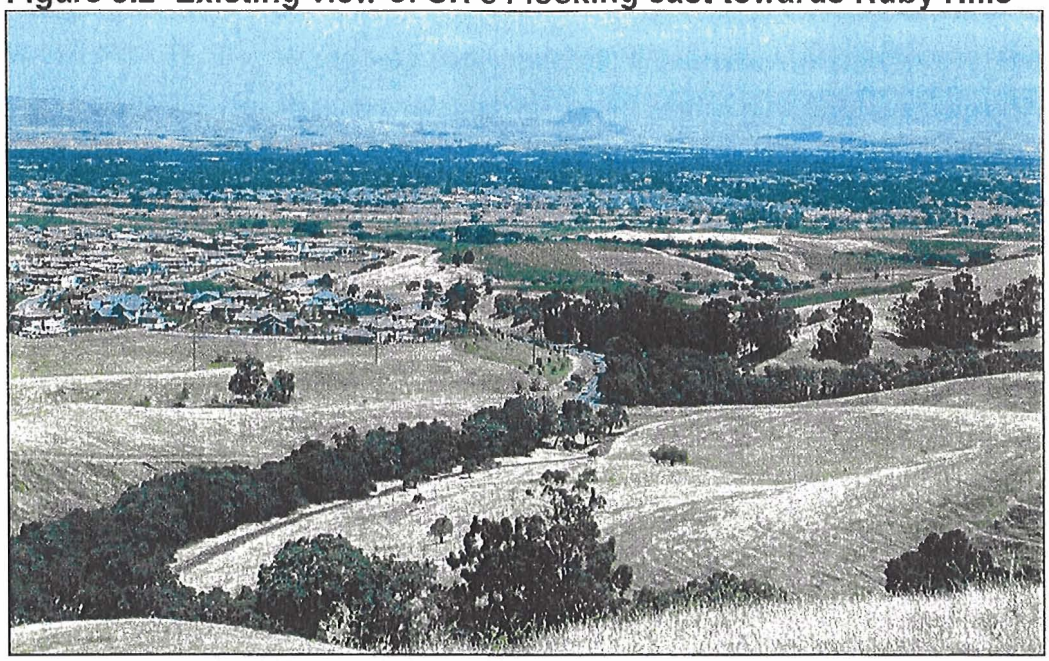


Figure 3.3 Visual simulation of future roadway alignment (90 and 105-km/h design speed alternatives).
Shown with proposed climbing lane.

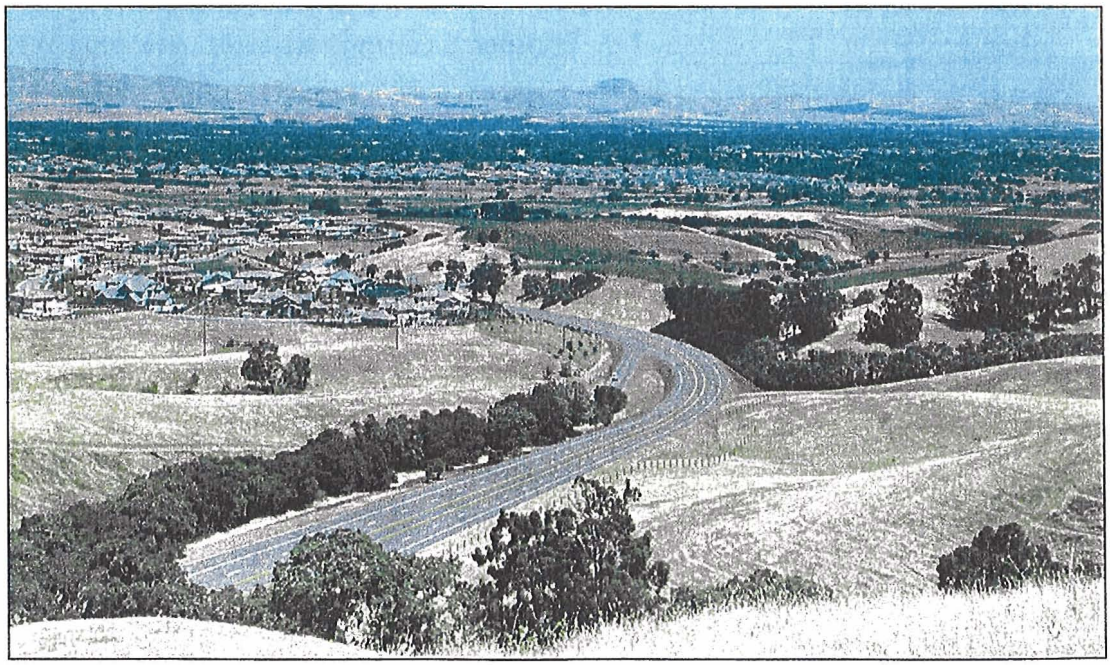


Figure 3.4 Existing view of SR 84 looking east - near postmile 21.0

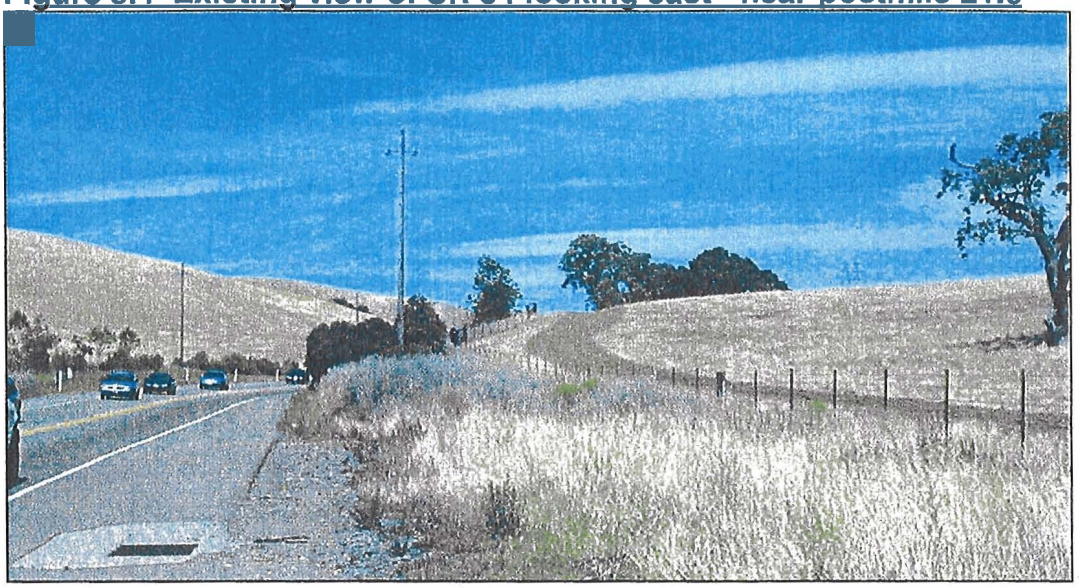


Figure 3.5 Visual simulation of proposed highway alignment (80 or 90-km/h design speed alternatives).
Shown with proposed climbing lane.

from one another, impacts are similar for all three alternatives. All alternatives (except for the no build) disrupt and alter the natural landscape and riparian vegetation that currently exists. Areas that are cleared and disturbed to temporarily expose the earth, especially the large cut slopes, would contrast with the undisturbed surrounding areas and would have the potential to attract the attention of viewers. These apparent scars would constitute a temporary visual impact.

Removal of any existing native trees and vegetation along the roadside to accommodate construction will impact the current visual character and interest of SR 84. The existing roadside slopes and hillsides will be impacted by construction of the project. No scenic vistas or view sheds will be impacted by the project.

3.15.3 Mitigation Measures

To minimize the degree of change and reduce visual impacts, mitigation techniques such as contour grading, slope rounding, re-vegetating and screen planting should be employed. The following specific design features are recommended.

- Cut and fill slopes would be contour graded and rounded so as to reflect the contours of adjacent, undisturbed topography to the extent feasible. Grading operations should not result in angular landforms.
- Design for gradual grade transitions (contour grading and slope rounding) at hinge and catch points of earthwork slopes, so as to reduce soil erosion and create a more natural appearing topography.
- Wood debris and green material generated from clearing and grubbing of the construction site shall be chipped into a mulch material and later spread over the disturbed slope area to aid in erosion control and re-vegetation.
- All exposed ground surfaces would be seeded with species such as perennial native grass and chaparral shrub seeds as early as possible for erosion control purposes and to preserve the natural landscape character. Plant species native to the area shall be used when re-vegetation is being performed.
- Oak trees that must be removed for construction of the project would be replaced at a ratio consistent with the biological assessment report.

- For any roadway structural elements, the Project Engineer and Landscape Architect shall coordinate for aesthetic treatments. For any existing roadway paving or elements that are to be abandoned, they shall be cleared and removed. The remaining topography and soils shall be reclaimed to match adjacent landform and vegetation cover.

- To help stabilize creek side slopes, fast-growing native willow trees will be planted in riparian areas.

- The existing grade around the base of remaining trees would be preserved to prevent the roots from being impacted by cut or fill earthwork.

- Once a roadway design plan has been selected, it is required that landscape re-vegetation and erosion control plans be prepared for the project prior to construction.

- Where rock slope protection and rock creek protection is specified, rock that is local and indigenous to the region would be used. If such rock is unavailable, and rock that has the potential for producing a glare to the environment is used, that rock would be stained with a coloring material.

3.16 Historic and Archaeological Resources

Federal regulation for cultural resources is governed primarily by Section 106 of the National Historic Preservation Act of 1966 (as amended). Section 106 requires federal agencies to take into account the effects of their actions on historic properties, and provides the Advisory Council on Historic Preservation the opportunity to comment on such actions. For compliance with NEPA, the FHWA follows the Council's implementing procedures contained in 36 CFR Part 800. Historic and archaeological resource studies performed pursuant to these statutes are documented in a Historic Property Survey Report prepared by Caltrans. For compliance with the California Environmental Quality Act (CEQA), the State Historic Preservation Office (SHPO) must provide concurrence with FHWA's findings regarding project impacts.

3.16.1 Affected Environment

The Area of Potential Effects (APE) encompasses direct or indirect effects associated with the alternatives that could cause alterations in the character or use of any historic

property. The architectural APE encompasses all parcels containing built resources from which Caltrans will acquire new right-of-way or easements. In addition, the architectural APE includes any property that might be affected by visual or other indirect effects caused by the highway realignment and widening. An archaeological APE encompasses all areas of potential ground disturbance associated with the proposed project, and this disturbance could extend from 10.00 to 280.00 m (32.81 to 918.64 ft) from the existing centerline along both sides of SR 84.

Nine parcels contain built resources that post-date 1957 and were treated in accordance with the "Caltrans Interim Policy for the Treatment of Buildings Constructing in 1957 or Later," which became effective on June 1, 2001. Caltrans staff reviewed the project's APE and confirmed that no buildings predate 1957 or appear to require further study. One archaeological site, CA-ALA-605H, was identified within the APE, but was determined to be ineligible for inclusion on the National Register. In a letter dated June 3, 2003, SHPO concurred with FHWA's determination that CA-ALA-605H is not eligible for inclusion in the National Register and concurred with the finding of No Historic Properties Affected, pursuant to 36 CFR 800.4 (d)(1).

3.16.2 Mitigation Measures

Although unlikely, it is possible that unidentified subsurface archaeological remains exist within the project limits and could be encountered during ground-disturbing activities. If buried cultural materials are encountered during construction, it is Caltrans policy to halt work in the immediate vicinity of the find until a qualified archaeologist can evaluate the nature and significance of the find. Additional surveys will be required if the project changes to include areas that have not been surveyed.

3.17 Unavoidable Adverse Impacts

The proposed project would not result in unavoidable adverse impacts. The project would not degrade the quality of the environment, or cause substantial adverse effects to human beings, either directly or indirectly. None of the impacts of this project are expected to contribute to a cumulatively considerable impact.

Chapter Four

Cumulative Impacts

Caltrans

Chapter 4 Cumulative Impacts

Table 4.1 Projects Considered in Cumulative Effects Evaluation

Responsible Agency	Project Name	Type of Project	Location	Status
Caltrans	SR 84 Realignment and Widening (EA 17240)	Safety project - realignment and widening	Vallecitos Hills/Pigeon Pass area, southwest of Livermore	Proposed project; Programmed for 04/05 fiscal year
Caltrans	SR 84 Resurfacing, Restoration and Rehabilitation (RRR)	Pavement overlay and shoulder widening	Between I-680 and west end of 17240, and from Ruby Hills Drive to Isabel Avenue on the east end of 17240	In construction
City of Livermore	Transfer of SR 84 from First Street to Isabel Ave	Route transfer	Downtown Livermore	Transferred December 17, 2003
Caltrans	The Ultimate Alignment	Road widening and realignment for a 4-lane expressway with climbing lanes over Pigeon Pass	SR 84 between I-580 and I-680	In early planning stage

4.1 Potential Cumulative Effects

For the purpose of this document, cumulative impacts will be addressed for the region including the city limits of Livermore, and the SR 84 corridor from Livermore west to the I-680 interchange. According to the Livermore General Plan Update, much of the open space left within the city limits is designated as open space in the form of resource management areas, parks, hillside conservation or agriculture. It is reasonable to consider that those areas will remain protected for the foreseeable future. The SR 84 corridor is a rural area with large parcels of privately owned property. Most of the property is used for ranching.

In addition to the Pigeon Pass project, another project in the SR 84 corridor is in the early planning stages. That project, sometimes referred to as the "ultimate alignment", proposes to widen Isabel Avenue and Vallecitos Road (SR 84) from Airway Boulevard to the I-680 interchange. The widening project will have similar impacts to sensitive species as the Pigeon Pass project. However, these cumulative impacts have been minimized to the extent possible by designing the Pigeon Pass realignment to mimic the future design of the widened ultimate alignment. This is

intended to reduce the amount of new ground disturbance, and additional habitat loss when the larger project is built. It is important to clarify that the Pigeon Pass safety project is a stand-alone project and does not depend upon the ultimate alignment. It is possible that once the ultimate alignment of SR 84 is complete, the privately owned open space surrounding it will be sold to developers and lost to residential and commercial uses. This additional loss could have cumulative impacts to sensitive species. The ultimate widening of SR 84 is several years away.

4.1.1 Special Status Species

When listed species are affected, consultation with USFWS under the Federal Endangered Species Act and CDFG under the California State Endangered Species Act would be completed for future projects that may occur in the area. Cumulatively, the viability of some sensitive species throughout the region could be impacted. Each project would mitigate for specific impacts through avoidance, creation, and preservation. Often, through mitigation requirements, the resource agencies are able to obtain large parcels of suitable habitat, creating a continuity that facilitates viability among individual species. This project is not expected to have an adverse cumulative effect to threatened and endangered wildlife and plant species.

4.1.2 Wetlands and Waters of the U.S.

Federal regulations require that there be no net loss of wetlands. All projects are required to incorporate water quality measures to prevent water pollution within and beyond project areas. With a no net loss of wetlands and mandatory water quality measures, it is expected that any impacts to wetlands and waters of the U. S. would be temporary in nature, and that mitigation of natural habitats would facilitate sustainability throughout the region.

4.1.3 Other Resources

The proposed project is not expected to contribute to cumulative effects to water quality, farmland, air quality, noise, floodplains, visual resources, hazardous waste, and cultural resources

Chapter Five

Comments and Coordination

Caltrans

Chapter 5 Comments and Coordination

Agency consultation and public participation for the project have been accomplished through a variety of formal and informal methods, including project development team meetings and interagency coordination meetings. This chapter summarizes the results of the Department's efforts to fully identify, address and resolve project-related issues through early and continuing coordination.

5.1 Public Involvement

Caltrans met with a private landowner on July 9, 2002 to discuss conducting environmental field studies on his property. This landowner owns a significant portion of the property adjacent to the proposed project. At this meeting, he explained that he needs to cross SR 84 for his cattle ranching activities, including hauling cattle with a semi-tractor trailer. To solve these issues, Caltrans proposed a vehicular undercrossing of adequate size to haul cattle from one side of SR 84 to the other. The landowner agreed and provisions for a grade-separated crossing have been included in the design of each of the three alternatives.

The draft Environmental Assessment/Initial Study was made available for public review and comment for 30 days. During the public review, a notice of availability and opportunity for a public workshop was advertised. Comments received during the review period have been included and addressed in this final Environmental Assessment/Initial Study.

5.2 Agency Coordination

U.S. Fish & Wildlife Service Consultation for Endangered Species Act

- A meeting was conducted on September 19, 2002 for Caltrans and USFWS to discuss San Joaquin kit fox and the potential presence of Alameda whipsnake
- Concurrence on "Early Evaluation for the San Joaquin Kit Fox", personal communication with Valerie Bloom, December 2002

- Consultation Pursuant to Section 7 of the Endangered Species Act, via FHWA was initiated in September 2003. Several meetings and teleconferences occurred to resolve mitigation issues prior to the issuance of the Biological Opinion.

U.S. Army Corps of Engineers Wetland Delineation

- Request for Verification of Wetland Delineation, pending

State Historic Preservation Office (SHPO) Letters

- Request for Concurrence of Historic Property Survey Report, From FHWA to SHPO, March 5, 2003.
- Concurrence of Findings from SHPO, June 3, 2003

5.3 Public Review and Comment

This Initial Study/Environmental Assessment (IS/EA) was provided to the public for review and comment during a 30 day period from June 7 to July 7, 2004. The availability of the IS/EA was publicly noticed in local area newspapers and the document was distributed by the State Clearinghouse and sent to local agencies. The State Clearinghouse letter acknowledging compliance with CEQA requirements is reproduced on the following page. The public comment letters and the Department's corresponding responses are also contained in the following pages.

Arnold
Schwarzenegger
Governor

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

Jan Boel
Acting Director

July 6, 2004

Jean L. Baker
Department of Transportation, District 4
P.O. Box 911
Marysville, CA 95901

Subject: Realignment and Widening
SCH#: 2004062018

Dear Jean L. Baker:

The State Clearinghouse submitted the above named Negative Declaration to selected state agencies for review. The review period closed on July 2, 2004, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Terry Roberts

Terry Roberts
Director, State Clearinghouse

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH# 2004062018
Project Title Realignment and Widening
Lead Agency Caltrans #4

Type Neg Negative Declaration

Description The project will realign and widen the highway within a 3.7 kilometer (2.3 mile) segment of state route 84 in Alameda County through the Vallecitos Hills/Pigeon Pass area, southwest of Livermore.

Lead Agency Contact

Name Jean A. Baker
Agency Department of Transportation, District 4
Phone 530-741-4498 **Fax**
email
Address P.O. Box 911
City Marysville **State** CA **Zip** 95901

Project Location

County Alameda
City Livermore
Region
Cross Streets
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways 84
Airports
Railways
Waterways Vallecitos Creek
Schools
Land Use Open Space with Agricultural and Residential uses.

Project Issues Wildlife; Wetland/Riparian; Water Quality; Vegetation; Traffic/Circulation; Soil Erosion/Compaction/Grading; Noise; Landuse; Growth Inducing; Geologic/Seismic; Flood Plain/Flooding; Drainage/Absorption; Cumulative Effects; Archaeologic-Historic; Air Quality; Agricultural Land; Aesthetic/Visual

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Reviewing Agencies Resources Agency; Regional Water Quality Control Board, Region 2; Department of Parks and Recreation; Native American Heritage Commission; Office of Historic Preservation; Department of Fish and Game, Region 3; Department of Water Resources; California Highway Patrol; Air Resources Board, Transportation Projects; State Lands Commission

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Date Received 06/03/2004 **Start of Review** 06/03/2004 **End of Review** 07/02/2004

Note: Blanks in data fields result from insufficient information provided by lead agency.

SAFETY PROJECT
ON
ROUTE 84 IN ALAMEDA COUNTY

PUBLIC WORKSHOP
JUNE 16, 2004

COMMENTS:

1. Mix of cars + Gravel trucks much more dangerous with improvements 1
2. Clear mark bicycle route if possible. 2
3. Closely spaced wildlife undercrossing evenly along route 3
4. Traffic signal at Vallecitos Nuclear Center with connect to Little Valley Rd. 4
5. Outlook point at crest of Pigeon Pass 5
6. Replace wet lands and habit near by along route 6
7. Physical barrier between lanes going E+W. 7
8. Support 90 km/h alternative
9. Limit Vehicle access to maintain flow. 8

Please drop off your comments in the Comment Box or return to:

Ron Kiaaina, Project Manager
Department of Transportation
111 Grand Avenue
Oakland, CA 94623
Phone (510) 286-4193

Your Name, Address and Phone Number (optional):

John Stein
1334 KATHY CT
Livermore
(925) 449-7896

Attach more sheets if necessary.

Response to Comments from John Stein

1. Phase I of the proposed project would improve the vertical and horizontal alignments, providing improved sight distance, standard shoulders, a median "buffer" and left turn pockets. Phase II of the proposed project would provide a climbing lane in each direction to allow slower moving vehicles to be passed. The two phases would provide safety and operational benefits for all vehicles utilizing the corridor.

2. The proposed project would provide 2-m (8-foot) shoulders in Phase I (current phase) and 3-m (10-foot) shoulders in Phase II (future phase). These shoulders, along with flatter grades and straighter alignment, would facilitate increased bicycle travel along the corridor. The proposed project does not, however, include signage for a bike route as this is outside the scope of the project. A separate project would be required to construct bike route improvements along the corridor.

3. Caltrans is aware of the conflicts between roadway traffic and animals crossing state highways. Numerous wildlife species that are commonly impacted by highways have been known to use drainage culverts for safe passage under highways. This project proposes to install twelve drainage culverts (stream crossings), and two driveway culvert undercrossings (upland). These structures will be spaced at varied distances between 25.9 m (85 ft) to 451.m (1,480 ft) along the length of the project. The location of undercrossings must take into consideration engineering requirements, topographic constraints, cost, and of course wildlife habits and needs. Therefore it is not always practical or beneficial to wildlife, to space crossings at even intervals. There are no known migration corridors along this stretch of highway, so placing additional non-drainage related undercrossings throughout the project is not considered a cost effective solution. The number, sizes and locations of the proposed culverts are considered sufficient, based on available information, and are an improvement over the current situation. The U.S. Fish and Wildlife Service (USFWS), which is responsible for the protection of endangered species, has issued a Biological Opinion which concurs with all of Caltrans' proposed mitigation measures. Certain species, such as the California red-legged frog and California tiger salamander are known to make point to point movements, instead of always following migration corridors. Other species, for example the San Joaquin kit fox, tend to use natural drainages when traveling. Since culverts are proposed at riparian stream crossings as well as in the grassy upland areas, this will likely increase the chances that species exhibiting either behavior will find the undercrossings during movements. The large driveway culverts have been specifically designed to accommodate large mammals, and will provide additional passage for smaller vertebrates as well. Modifications to culverts (i.e. fencing, lighting, etc.) that may further encourage undercrossing usage are currently being investigated. Additions, such as fencing or artificial lighting, do not always benefit a species and sometimes cause more harm than good. It is Caltrans' intention that the culverts be used by multiple species so care must be taken to ensure that a modification for one species is not detrimental to another.

4. Due to the low volume of vehicles from the Vallecitos Nuclear Center, a traffic signal is not warranted at this location. The Department, however, acknowledges the difficulty for vehicles entering and leaving the facility during existing peak conditions and proposes low cost striping improvements to Route 84 at the facility entrance. These improvements will provide storage and a short acceleration/merge lane for vehicles turning left onto eastbound Route 84 towards Livermore. The Department will initiate a separate project to implement the striping improvements.

5. Construction of a vista point is not included within the project scope as it falls outside of the project's purpose which is to improve safety and traffic operations. A vista point at the crest of the pass may be considered in the future, but would be initiated as a separate project.

6. Some degree of habitat replacement will be accomplished on site where appropriate. Wetlands will be replaced at a mitigation bank as close to the project location as practicable. Permits require that wetland mitigation be protected in perpetuity. Replacing wetlands on site along the route does not afford protection from future development and destruction. Some of the oak woodland habitat will be replaced on site where site conditions are suitable. The remainder of the oak woodland will be placed off site. Caltrans is currently working with a local city park to investigate possibilities for replacement of the remaining oak mitigation at the park. Any mitigation accomplished at the park has the benefit of being protected in perpetuity.

7. The project would provide a paved median "buffer" to separate eastbound and westbound Route 84 traffic. The median "buffer" would be used in lieu of a physical barrier to provide errant vehicles greater room for recovery. A structural barrier separating traffic is usually reserved for high volume multiple lane highways where there is a greater potential for cross over accidents. It is anticipated that with an improved highway alignment combined with a median "buffer," a structural barrier is not needed.

8. The proposed project would construct two access roads with undercrossings, one at the eastern end and one at the western end of the project. Property owners on both sides of the highway would access Route 84 from these access roads. This approach would minimize the number of vehicular access openings on Route 84, thus reducing potential conflicts and maintaining traffic flow.

[redacted]

Response to Comment Card from John Stein

1. According to Public Resources Code Secs. 21080(d), 21082.2 (d); Guidelines sec. 15064, CEQA requires the preparation of an Environmental Impact Report (EIR) for projects having potential significant environmental effects. The purpose of an EIR is to inform decision makers and the public about a project's significant environmental effects and to identify mitigation measures and reasonable alternatives to avoid the significant effects. Based on Caltrans' analysis of the project and the circulation and completion of the IS/EA, it has been determined that there are no significant environmental effects associated with this project. Therefore, the appropriate environmental approval document will be a CEQA Negative Declaration (ND) / NEPA Finding of No Significant Impact (FONSI).

SAFETY PROJECT
ON
ROUTE 84 IN ALAMEDA COUNTY

PUBLIC WORKSHOP
JUNE 16, 2004

COMMENTS:

We definitely favor the 90 KM which would be a complete buy out of our home & property, also the least costly of the three alternatives

The 80KM alternative partial buy out of our property and a new right of way access to our home with a retaining wall we would not want to see happen increasing traffic proposing unsafe conditions and generate noise levels decreasing our property value and cutting our front yard in half

Please drop off your comments in the Comment Box or return to:

Ron Kiaaina, Project Manager
Department of Transportation
111 Grand Avenue
Oakland, CA 94623
Phone (510) 286-4193

Your Name, Address and Phone Number (optional):

ROBERT PIERCE
1700 VALLECITOS RD
LIVERMORE CA. 94550

Attach more sheets if necessary.

STATE OF CALIFORNIA

ARNOLD SCHWARZENEGGER, *Governor*

PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298

June 28, 2004

File No.183-1
SCH# 2004062018

Jean L. Baker
California Department of Transportation
P.O. Box 911
Marysville, CA 95901

RE: Notice of Completion for Realignment and Widening of State Highway 84

Dear Ms. Baker:

As the state agency responsible for rail safety within California, we recommend that any projects planned adjacent to or near the rail corridors in the County are planned with the safety of these rail corridors in mind. New developments may contribute to an increase in traffic volumes not only on streets and at intersections, but also at at-grade highway-rail crossings.

Safety factors to consider include the planning for grade separations for major thoroughfares, improvements to existing at-grade highway-rail crossings due to increase in traffic volumes and appropriate fencing to limit the access of trespassers onto the railroad right-of-way.

The above-mentioned safety improvements should be considered when approval is sought for new development. Working with Commission staff early in the conceptual design phase will help improve the safety to motorists in the City.

If you have any questions in this matter, please call me at (916) 324-7134

Very truly yours,

David Stewart
Utilities Engineer
Consumer Protection and Safety Division

Response to Comment from Public Utility Commission

- The Pigeon Pass realignment and widening project is not in close proximity to a rail corridor; therefore, these recommendations would not apply to the proposed project.

Schafer Vallecitos Laboratory
6705 Vallecitos Road
Sunol, California 94586

Ron Kiaaina ron_kiaaina@dot.ca.gov
California Department of Transportation
P.O. Box 23660
Oakland, California 94623-0060

July 7, 2004

Dear Ron:

Thank you for the opportunity to comment on the Initial Study/ Environmental Assessment for a highway safety improvement project on State Route 84 in Alameda County. We would like to offer some specific comments as to how this project might affect our employees as well as general comments on the project and process. Schafer Corporation has over 35 employees located at the General Electric Vallecitos Facility. While overall we support the proposed project in particular the 90 km/h alternative we would like to offer the following comments.

All of the alternatives except for the "no build " option would appear to increase the traffic levels and perhaps carry a higher speed to the entrance to our facility, the Vallecitos Nuclear Center. Our major concern is the safe entry and exit of our employees from this site. In particular the eastbound left turn across a continuous lane of traffic in the morning and the left turn from the site into the heavily traveled eastbound traffic lane in the evening. This turning movement does not have a merging lane. We would like to see a merging lane for eastbound traffic installed as part of this project, could this be considered? Our ultimate preference is an on demand traffic signal at the entrance to this site. The hours of operation could be limited to weekday rush hours. We believe that traffic levels and safety considerations support this safety upgrade. Could this be included as part of the project mitigations? Would there be further studies without further CEQA environmental documentation? 1

It appears that the proposed improvements are designed to accommodate or perhaps even encourage increased truck traffic. Is this a wise decision? Even with improvements trucks are a hazard because of the mismatch in speed and merging actions. There is also a problem with damaging rocks coming off the various surfaces. Is a possible that the final out come may reduce automobile capacity of the roadway because of the large intervehicle spacing between trucks to help avoid stopping or rapid changes of speed by trucks? 2

Based upon the recent accident history on Vasco Road, to improve motorist safety, we would like to see some sort of vehicle barrier beyond the 12 foot spacing separating the lanes going in opposite directions. Either a structural barrier or some substantial 3

vegetation would meet this goal. Vegetation would also reduce the glare from oncoming traffic headlights. Is this a reasonable mitigation?

Will the turnouts/outlook points and opportunity for public U-turns near the crest of Pigeon pass be retained? These turnouts seem to avoid even more unsafe U-turns on this road. 4

Wildlife/vehicle interactions and attempts to avoid them are already a significant safety hazard as well as causing vehicle damage in the case of larger animals such as deer, coyotes, and turkey vultures. While there are a number of culverts and under crossings mentioned it would help to add additional larger under crossings for the larger species such as deer, mountain lions, fox, raccoons, turkeys, coyotes, and the range of small reptiles and mammals at intervals of about 300-500 yards along the entire route being improved. This together with fencing with small openings would reduce the take of local wildlife and allow the relatively safe migration across the proposed right of way. By avoiding sudden stops and lane changes this would improve traffic safety. 5

We would like to support further CEQA studies and perhaps a Full Environmental Impact Report. We would like to see our safety concerns addressed with more specificity. A number of the mitigations and monitoring programs lack details and there is no description of who is responsible for and will fund enforcement of these requirements. Could these items be more fully described in a full EIR? 6

We look forward to you response and would like to be informed of any future actions regarding this project.

Sincerely,

Dave Farkas dfarkas@schaferlabs.com
Manager Schafer Vallecitos AEM Group

Response to Comments from Schafer Vallecitos Laboratory

1. This proposed project, which begins roughly one mile east of the Vallecitos Nuclear Center entrance, will not in itself cause a significant increase in traffic volumes on Route 84 in the vicinity of the facility entrance. Due to the low volume of vehicles from the Vallecitos Nuclear Center, a traffic signal is not warranted at this location. However, the Department acknowledges the difficulty for vehicles entering and leaving the facility during existing peak conditions and proposes low cost striping improvements to Route 84 at the facility entrance. These improvements will provide storage and a short acceleration/merge lane for vehicles turning left onto eastbound Route 84 towards Livermore. The Department will initiate a separate project to implement the striping improvements.

2. Under Phase I, the proposed project would improve vertical and horizontal roadway alignments, thus providing benefits for all vehicles utilizing the corridor. Under Phase II, the proposed project would provide climbing lanes to allow slower moving vehicles to be passed. This would provide an operational improvement that would again benefit all vehicles.

3. The project would provide a paved median "buffer" to separate eastbound and westbound Route 84 traffic. This "buffer" would be used in lieu of a physical barrier to provide errant vehicles room to recover without crossing into oncoming traffic. A structural barrier separating traffic is usually reserved for high volume multiple lane highways where there is a greater potential for cross over accidents. It is anticipated that, with an improved highway alignment combined with a median "buffer," a structural barrier is not needed. Vegetation in the median is not a part of this project as it would require a substantially wider cross section in order to attain sufficient stopping sight distance along the curves.

4. The proposed project would create a new alignment for Route 84, and the "turnouts/lookout points" near the crest of Pigeon Pass on the existing alignment would not be perpetuated with this new alignment. Construction of two access roads would be utilized to provide access to adjacent properties. U-turns could be made using these segments to exit and re-enter the new Route 84 alignment.

5. Refer to response #3 to Comments from John Stein

6. All of the environmental impacts associated with the proposed project have been studied and disclosed in a public document. According to Public Resources Code Secs. 21080(d), 21082.2(d); Guidelines sec. 15064, CEQA requires the preparation of an Environmental Impact Report (EIR) for projects having potential significant environmental effects. Based on the Department's environmental analysis, information received through coordination and consultation with regulatory agencies and input received from circulation of the environmental document to the public and to public agencies, it has been determined that this project will not result in significant environmental effects. In compliance with CEQA, a Negative Declaration (ND) will be prepared. The absence of details regarding mitigation measures and mitigation monitoring programs in the environmental document was due to the fact that consultation with the USFWS was occurring concurrently with public circulation of this document. Mitigation measures are proposed by Caltrans but approved by regulatory agencies and often modified or refined as a result of agency consultation. The mitigation details to which you refer are now included in the ND. (Refer to the

Biological Opinion issued by the USFWS and contained in Appendix E.) The monitoring program to which you refer will be developed during the permit application process. Following approval of the environmental document, the USFWS acknowledges that the environmental document (an ND in this case) is the proper type of CEQA document for the proposed scope of work and associated biological impacts by issuing a permit to allow construction to proceed. Caltrans' proposed mitigation monitoring program will outline all the relevant details and will be submitted to the regulatory agencies at the permit application stage for their review and approval.

GE Energy

David W. Turner
Mgr, Regulatory Compliance & EHS
david.turner@gene.ge.com

Tuesday, July 13th, 2004

File Copy DWT-2004-30

Ron Kiaaina, Project Manager
California Department of Transportation
PO BOX 23660
Oakland, CA 94623-0660

Subject: State Route 84 in Alameda County
Reference: Rt. 84 Realignment and Widening Initial Study/Environmental Assessment
http://www.dot.ca.gov/dist3/departments/envinternet/ala84/ala84.htm

Dear Mr. Kiaaina:

It was a pleasure speaking to you on July 7th, and I appreciate the opportunity to comment on the proposed widening of State Route 84 east of our facility.

The GE Vallecitos facility is a research facility. Our primary focuses are to provide information to electric utilities or government contractors and medical devices or radiopharmaceuticals to hospitals. We have about 75 full time employees, a tenant with 35 employees and an additional 20 part time and contractor employees working on our facility. This results in about 150 round trips or 300 entrances and exits off of State Route 84 each weekday.

As many of the people working here commute through Pigeon Pass, we eagerly anticipate improvements in safety and efficiency of that portion of the roadway. While that aspect of the project would benefit everyone using State Route 84, an unintended consequence would be to reduce the safety and efficiency at the intersection of our access road with State Route 84. 1

As we discussed on the phone, GE Vallecitos would encourage CalTrans to study methods for making the entrance and exit of traffic to Vallecitos Site Access Road safer. The final assessment of the proposed widening project should include the impact and safety of feeders to State Route 84 as well as the impact within the project boundary.

Current traffic patterns at this intersection include a left turn from State Route 84 onto Vallecitos Site Access Road, and a slightly wider than two single lanes used for limited

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GENE Vallecitos Nuclear Center
Mail Code V-18
6705 Vallecitos Rd
Sunol, CA 94586
T.925.862.4360

acceleration room when turning left from Vallecitos Site Access Road. . During the morning commute, vehicles turning left into our facility wait for a long time to make the turn and often are only able to do so as heavy trucks climbing Pigeon Pass create a traffic break in the westbound traffic. Similarly, during the evening commute, vehicles turning left from our facility have to wait for a break in the westbound traffic and then merge conditional to eastbound drivers good will, using the taper from the eastbound turn lane as a makeshift acceleration lane. This room used for acceleration is actually marked with a double yellow line making that technique technically against the rules of the road

Proposed solutions for the intersection in question may include traffic lights, merging lanes or a frontage road. An on demand traffic light would be very similar to the traffic control at the entrance to Ruby Hills subdivision on eastern side of the proposed widening project, causing no more disruption to traffic than already exists. The use of the existing roadway as a frontage road is already proposed for a different section of State Route 84 in the 90-km/hr option, and would seem to mesh well with the discussed "Ultimate Alignment" of State Route 84. While it would work for most traffic, some of the delivery vehicles accessing GE Vallecitos are very heavy and large tractor-trailers, which would have difficulty with tight turns or cloverleaf arrangements.

Our tenant, Schafer Vallecitos Laboratory, submitted comments last week. In general, GE Vallecitos agrees with their assessment.

We look forward to working with you and your colleagues to achieve the modifications to the initial plan that will provide the greatest safety and efficiency to those accessing our facility as well as to all travelers on State Route 84. We would like to take you up on your offer to have one or tow of the project engineers meet with GE and Schafer management to discuss the project and potential safety concerns.

Thank you again for you consideration in this matter.

Sincerely Yours,

Digitally signed by David W. Turner
Date: 2004.07.19 13:35:03 -07'00'
Location: Vallecitos Nuclear Center

David W. Turner
Manager, Regulatory Compliance & EHS

Response to Comments from GE Energy

1. Refer to response #1 to comments from Schafer Vallecitos Laboratory.

"Steve and Cynthia Sund"
<scsund@comcast.net
>

09/01/2004 08:29 PM

To: <christel_little@dot.ca.gov>
cc:
Subject: 84

I like the fastest speed alternative. Are there any plans to widen Vallecitos from 680 to this project to 4 lanes? If not, the bottleneck will remain as you come off the freeway. I can't understand the detailed plans very well, but the road remains 2 lanes with an additional climbing lane up the hill?? 1

The references to Ruby "Hills" should be Ruby Hill for future reference (no "s")!

Anyway, any time frame on this project, and any plans to widen Isabel to 4 lanes in the next 5 years or so? Is the interchange at 580/Isabel just an unfunded dream 5-10 years away??? 2

Thanks, I realize a couple of my questions are beyond the scope of the EIR, I just thought you would know..

Response to Comments from Steve and Cynthia Sund

1. The project will realign the roadway and will feature one through lane in each direction with climbing lanes, wider shoulders, and a median buffer. Due to funding constraints, the project will be constructed in two phases. Phase I will realign the highway starting in late 2005; phase 2 will add the climbing lanes when funding becomes available in the future. The project will improve traffic safety by correcting the alignment and will improve traffic flow by allowing vehicles to bypass slower-moving vehicles over the pass.

2. While the project does not add through lanes to the Route 84 corridor, there are plans for several congestion relief projects along the corridor between I-580 and I-680. Caltrans is working with the Alameda County Transportation Improvement Authority (ACTIA) to widen Isabel Avenue. This project is now beginning the environmental analysis phase with construction estimated to start in 2011. For more information about this project, please see the ACTIA website (**http://www.acta2002.com/2000**_MEASURE_B/2000_MEASURE_B.html). There is also a project to construct a new interchange on I-580 that connects directly to Isabel Avenue. While funding for this project is uncertain, Caltrans is working with the City of Livermore to resolve funding issues. Construction on this project is likely to start by 2010. Lastly, there are plans to widen Route 84 between Isabel Avenue and I-680. However, due to the high cost combined with funding uncertainties, the timeframe for this project is beyond 10 years.

Chapter Six

List of Preparers

Caltrans

Chapter 6 List of Preparers

This Initial Study/ Environmental Assessment was prepared by the North Region of the California Department of Transportation (Caltrans). The following Caltrans staff prepared this Initial Study/ Environmental Assessment:

Baker, Gwyn, Associate Environmental Planner. Four years experience in environmental planning and document preparation. **Contribution: Document Preparation.**

Baker, Jean L., Senior Environmental Planner. Twenty years experience in preparing and supervising the preparation of environmental documents. **Contribution: Environmental Branch Chief.**

Little, Christel, Associate Environmental Planner. Twenty years experience in environmental planning and document preparation. **Contribution: Document Preparation.**

Ferreira, Alan, P.E., Transportation Engineer. Seven years experience in design and project development. **Contribution: Project Engineer, PS&E Phase**

Grady, Kathleen, Landscape Associate. Twenty years experience performing visual impact assessments. **Contribution: Visual Impact Assessment.**

Haney, Jeff, Associate Environmental Planner (Archaeology). Twenty years experience, including ten years in California archaeology. **Contribution: Historic Property Survey Report**

Hoole, John, P.E. Transportation Engineer. Twelve years experience in design and project development. **Contribution: Project Engineer, PA&ED Phase**

Hui, Cyrus, P.E., Senior Transportation Engineer. Twenty-three years experience in design and project development, eleven years as Senior Transportation Engineer. **Contribution: Design Branch Chief.**

Kiaaina, Ron, Project Manager. Two and half years experience in project development and delivery. **Contribution: Project Manager.**

Melani, Mark, Environmental Engineer. Fifteen years experience in hazardous waste studies. **Contribution: Updated Hazardous Waste Initial Site Assessment.**

Penders, Sean, P.E., Water Quality Engineer. Nine years experience in storm water and water quality analysis. **Contribution: Water Quality Report.**

Speckert, Lynn, Associate Environmental Planner (Air/Noise). Ten years experience performing air and noise studies. **Contribution: Air and Noise Reports.**

Tate, Darla, Associate Environmental Planner. Six years experience working with CEQA, two years experience environmental document preparation with Caltrans. **Contribution: Former Environmental Coordinator.**

Tordoff, Judy, Associate Environmental Planner (Archaeology). Thirty-five years experience, including twenty years in California archaeology. **Contribution: Historical Resource Evaluation Report.**

Wilson, Steve, P.E., Transportation Engineer. Seventeen years in design and project development. **Contribution: Project Engineer.**

Zahner, Shanna, Associate Environmental Planner (Natural Sciences). Five years experience in biological studies. **Contribution: Natural Environment Study report and Biological Assessment.**

Appendix A

California Environmental Quality Act Evaluation

Caltrans

Appendix A California Environmental Quality Act Evaluation

CEQA Environmental Checklist

The following checklist identifies physical, biological, social, and economic factors that might be affected by the proposed project. The CEQA impact levels include potentially significant impact, less than significant impact with mitigation, less than significant impact, and no impact. Please refer to the following for detailed discussions regarding impacts:

CEQA:

- Guidance: Title 14, Chapter 3, California Code of Regulations, Sections 15000 et seq. (http://www.ceres.ca.gov/topic/env_law/ceqa/guidelines/)
- Statutes: Division 13, California Public Resource Code, Sections 21000-21178.1 (http://www.ceres.ca.gov/topic/env_law/ceqa/stat/)

CEQA requires that environmental documents determine significant or potentially significant impacts. In many cases, background studies performed in connection with the project indicate that there will be no impacts. A "no impact" reflects this determination. Any needed discussion is included in the section following the checklist.

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
AESTHETICS - Would the project:				
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic building within a state scenic highway?			X	
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?				X
AGRICULTURE RESOURCES - In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?			X	
AIR QUALITY - Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?				X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	X
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	X
d) Expose sensitive receptors to substantial pollutant concentration?	☐	☐	☐	X
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	X
BIOLOGICAL RESOURCES - Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	X	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	X	☐
C) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	X	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	X	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X
COMMUNITY RESOURCES - Would the project:				
a) Cause disruption of orderly planned development?				X
b) Be inconsistent with a Coastal Zone Management Plan?				X
c) Affect life-styles, or neighborhood character or stability?				X
d) Physically divide an established community?				X
e) Affect minority, low-income, elderly, disabled, transit-dependent, or other specific interest group?				X
f) Affect employment, industry, or commerce, or require the displacement of businesses or farms?				X
g) Affect property values or the local tax base?				X
h) Affect any community facilities (including medical, educational, scientific, or religious institutions, ceremonial sites or sacred shrines?				X
i) Result in alterations to waterborne, rail, or air traffic?				X
j) Support large commercial or residential development?				X
k) Affect wild or scenic rivers or natural landmarks?				X
l) Result in substantial impacts associated with construction activities (e.g., noise, dust, temporary drainage, traffic detours, and temporary access, etc.)?			X	

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
CULTURAL RESOURCES - Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?				X
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?				X
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				X
d) Disturb any human remains, including those interred outside of formal cemeteries?				X
GEOLOGY AND SOILS - Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				X
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?			X	
b) Result in substantial soil erosion or the loss of topsoil?			X	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.				X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	X
HAZARDS AND HAZARDOUS MATERIALS - Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	X
b) Create a significant hazard to the public or the environment through reasonably forseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	X
c) Emit hazardous emissions or handle hazardous or acutely hazardous material, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
HYDROLOGY AND WATER QUALITY - Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	X	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	X
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface run-off in a manner which would result in flooding on- or off-site?	☐	☐	☐	X
e) Create or contribute run-off water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted run-off?	☐	☐	X	☐
f) Otherwise substantially degrade water quality?	☐	☐	☐	X
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	X
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	X
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
LAND USE AND PLANNING - Would the project:				
a) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	X
b) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	X
MINERAL RESOURCES - Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	X
NOISE - Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	X
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	X
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	X	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
POPULATION AND HOUSING - Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	X
PUBLIC SERVICES -				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	X
Police protection?	☐	☐	☐	X
Schools?	☐	☐	☐	X
Parks?	☐	☐	☐	X
Other public facilities?	☐	☐	☐	X
RECREATION -				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
TRANSPORTATION/TRAFFIC - Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	X
b) Exceed, either individually or cumulatively, in a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	X
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incomplete uses (e.g., farm equipment)?	☐	☐	☐	X
e) Result in inadequate emergency access?	☐	☐	☐	X
f) Result in inadequate parking capacity?	☐	☐	☐	X
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	X
UTILITY AND SERVICE SYSTEMS - Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	X
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	X

	Potentially significant impact	Less than significant impact with mitigation	Less than significant impact	No impact
e) Result in determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	X
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	X
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	X
MANDATORY FINDINGS OF SIGNIFICANCE -				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, or cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	X	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	X	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	X

Appendix B

Title VI Policy Statement

Caltrans

Appendix B Title VI Policy Statement

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE DIRECTOR
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Flex your power!
Be energy efficient!

January 14, 2005

TITLE VI
POLICY STATEMENT

The California Department of Transportation under Title VI of the Civil Rights Act of 1964 and related statutes, ensures that no person in the State of California shall, on the grounds of race, color, national origin, sex, disability, and age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity it administers.

WILL KEMPTON
Director

"Caltrans improves mobility across California"

Appendix C

Summary of Relocation Benefits

Caltrans

Appendix C Summary of Relocation Benefits

California Department of Transportation Relocation Assistance Program

RELOCATION ASSISTANCE ADVISORY SERVICES
The California Department of Transportation (the Department) will provide relocation advisory assistance to any person, business, farm or non-profit organization displaced as a result of the Department's acquisition of real property for public use. The Department will assist residential displacees in obtaining comparable decent, safe and sanitary replacement housing by providing current and continuing information on sales price and rental rates of available housing. Non-residential displacees will receive information on comparable properties for lease or purchase.

Residential replacement dwellings will be in equal or better neighborhoods, at prices within the financial means of the individuals and families displaced, and reasonably accessible to their places of employment. Before any displacement occurs, displacees will be offered comparable replacement dwellings that are open to all persons regardless of race, color, religion, sex or national origin, and are consistent with the requirements of Title VIII of the Civil Rights Act of 1968. This assistance will also include supplying information concerning federal and state assisted housing programs, and any other known services being offered by public and private agencies in the area.

RESIDENTIAL RELOCATION PAYMENTS PROGRAM
The Relocation Payment program will assist eligible residential occupants by paying certain costs and expenses. These costs are limited to those necessary for, or incidental to, purchasing or renting a replacement dwelling, and actual reasonable expenses incurred in moving to a new location within 80 kilometers (50 miles) of the displacee's property. Any actual moving costs in excess of 80 kilometers (50 miles) are the responsibility of the displacee. The Residential Relocation Program can be summarized as follows:

Moving Costs
Any displaced person who was "lawfully" in occupancy of the acquired property regardless of the length of occupancy in the property acquired will be eligible for reimbursement of moving costs. Displacees will receive either the actual reasonable costs involved in moving themselves and personal property up to a maximum of 80 kilometers (50 miles), a moving service authorization, or a fixed payment based on a fixed moving cost schedule which is determined by the number of furnished or unfurnished rooms of the displacement dwelling.

Purchase Supplement
In addition to moving and related expenses payments, fully eligible homeowners may be entitled to payments for increased costs of purchasing replacement housing.

Homeowners who have owned and occupied their property for 180 days prior to the date of the first written offer to purchase the property, may qualify to receive a price differential payment equal to the difference between the Department's offer to purchase their property and the price of a comparable replacement dwelling, and may qualify to receive reimbursement for certain nonrecurring costs incidental to the purchase of the replacement property. An interest differential payment is also available if the interest rate for the loan on the replacement dwelling is higher than the loan rate on the displacement dwelling, subject to certain limitations on reimbursement based upon the replacement property interest rate. Also the interest differential must be based upon the "lesser of" either the loan on the displacement property or the loan on the replacement property. The maximum combination of these three supplemental payments that the owner-occupants can receive is $22,500. If the calculated total entitlement (without the moving payments) is in excess of $22,500, the displacee may qualify for the Last Resort Housing described below.

Rental Supplement
Tenants who have occupied the property to be acquired by the Department for 90 days or more and owner-occupants who have occupied the property 90 to 180 days prior to the date of the first written offer to purchase may qualify to receive a rental differential payment. This payment is made when the Department determines that the cost to rent a comparable and "decent, safe and sanitary" replacement dwelling will be more than the present rent of the displacement dwelling. As an alternative, the eligible occupant may qualify for a down payment benefit designed to assist in the purchase of a replacement property and the payment of certain costs incidental to the purchase, subject to certain limitation noted below under the "Down Payment" section (see below). The maximum amount of payment to any tenant of 90 days or more and any owner-occupant of 90 to 179 days, in addition to moving expenses, will be $5,250. If the calculated total entitlement for rental supplement exceeds $5,250, the displacee may qualify for the Last Resort Housing Program described below.

The rental supplement of $7,500 or less will be paid in a lump sum, unless the displacee requests that it be paid in installments. The displaced person must rent and occupy a "decent, safe and sanitary" replacement dwelling within one year from the date the Department takes legal possession of the property, or from the date the displacee vacates the Department-acquired property, whichever is later.

Down Payment
Displacees eligible to receive a rental differential payment may elect to apply it to a down payment for the purchase of a comparable replacement dwelling. The

down payment and incidental expenses cannot exceed the maximum payment of $5,250, unless the Last Resort Housing Program is indicated. The one-year eligibility period in which to purchase and occupy a "decent, safe and sanitary" replacement dwelling will apply.

Last Resort Housing
Federal regulations (49 CFR 24.404) contain the policy and procedure for implementing the Last Resort Housing Program on federal aid projects. In order to maintain uniformity in the program, the Department has also adopted these federal guidelines on non-federal-aid projects. Except for the amounts of payments and the methods in making them, last resort housing benefits are the same as those benefits for standard relocation as explained above. Last resort housing has been designed primarily to cover situations where available comparable replacement housing, or when their anticipated replacement housing payments, exceed the $2,520 and $22,500 limits of the standard relocation procedures. In certain exceptional situations, last resort housing may also be used for tenants of less than 90 days.

After the first written offer to acquire the property has been made, the Department will, within a reasonable length of time, personally contact the displacees to gather important information relating to:
• Preferences in area of relocation.
• Number of people to be displaced and the distribution of adults and children according to age and sex.
• Location of school and employment.
• Special arrangements to accommodate any handicapped member of the family.
• Financial ability to relocate into comparable replacement dwelling, which will house all members of the family decently.

The above explanation is general in nature and is not intended to be a complete explanation of relocation regulations. Any questions concerning relocation should be addressed to the Department. Any persons to be displaced will be assigned a relocation advisor who will work closely with each displacee in order to see that all payments and benefits are fully utilized, and that all regulations are observed, thereby avoiding the possibility of displacees jeopardizing or forfeiting any of their benefits or payments.

THE BUSINESS AND FARM RELOCATION ASSISTANCE PROGRAM

The Business and Farm Relocation Assistance Program provides aid in locating suitable replacement property for the displacee's farm or business, including, when requested, a current list of properties offered for sale or rent. In addition, certain types of payments are available to businesses, farms, and non-profit organizations. These payments may be summarized as follows:

- Reimbursement for the actual direct loss of tangible personal property incurred as a result of moving or discontinuing the business in an amount not greater than the reasonable cost of relocating the property.
- Reimbursement up to $1,000 of actual reasonable expenses in searching for a new business site.
- Reimbursement up to $10,000 of actual reasonable expenses related to the reestablishment of the business at the new location.
- Reimbursement of the actual reasonable cost of moving inventory, machinery, office equipment and similar business-related personal property, including dismantling, disconnecting, crating, packing, loading, insuring, transporting, unloading, unpacking, and reconnecting personal property.

Payment "in lieu" of moving expense is available to businesses which are expected to suffer a substantial loss of existing patronage as a result of the displacement, or if certain other requirements such as inability to find a suitable relocation site are met. This payment is an amount equal to the average annual net earnings for the last two taxable years prior to relocation. Such payment may not be less than $1,000 and not more than $20,000.

ADDITIONAL INFORMATION

No relocation payment received will be considered as income for the purpose of the Internal Revenue Code of 1954 or for the purposes of determining eligibility or the extent of eligibility of any person for assistance under the Social Security Act or any other federal law (except for any federal law providing low-income housing assistance).

Persons who are eligible for relocation payments and who are legally occupying the property required for the project will not be asked to move without being given at least 90 days advance notice, in writing. Occupants of any type of dwelling eligible for relocation payments will not be required to move unless at least one comparable "decent, safe and sanitary" replacement residence, open to all persons regardless of race, color, religion, sex or national origin, is available or has been made available to them by the state.

Any person, business, farm or non-profit organization, which has been refused a relocation payment by the Department, or believes that the payments are inadequate, may appeal for a hearing before a hearing officer or the Department's Relocation Assistance Appeals Board. No legal assistance is required; however, the displacee may choose to obtain legal council at his/her expense. Information about the appeal procedure is available from the Department's Relocation Advisors.

The information above is not intended to be a complete statement of all of the Department's laws and regulations. At the time of the first written offer to purchase, owner-occupants are given a more detailed explanation of the state's relocation services. Tenant occupants of properties to be acquired are contacted immediately

after the first written offer to purchase, and also given a more detailed explanation of the Department's relocation programs.

IMPORTANT NOTICE
To avoid loss of possible benefits, no individual, family, business, farm or non-profit organization should commit to purchase or rent a replacement property without first contacting a Department of Transportation relocation advisor at:

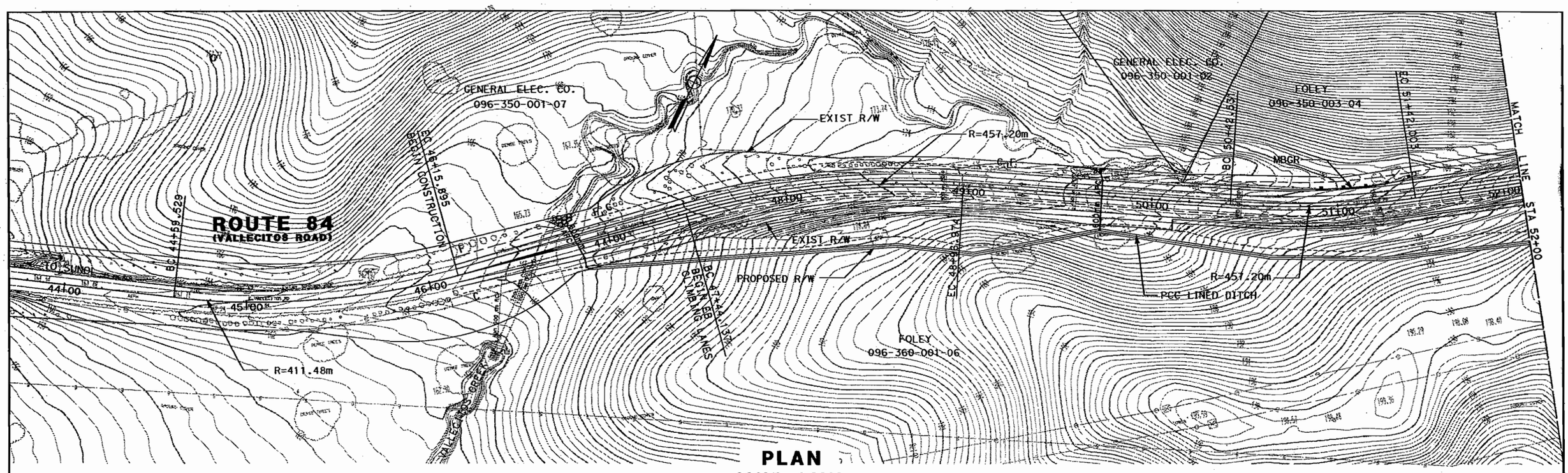
State of California
Department of Transportation, District 4
111 Grand Ave
Oakland, CA 94612

Appendix D

Plan Sheets

Caltrans

Appendix D Plan Sheets



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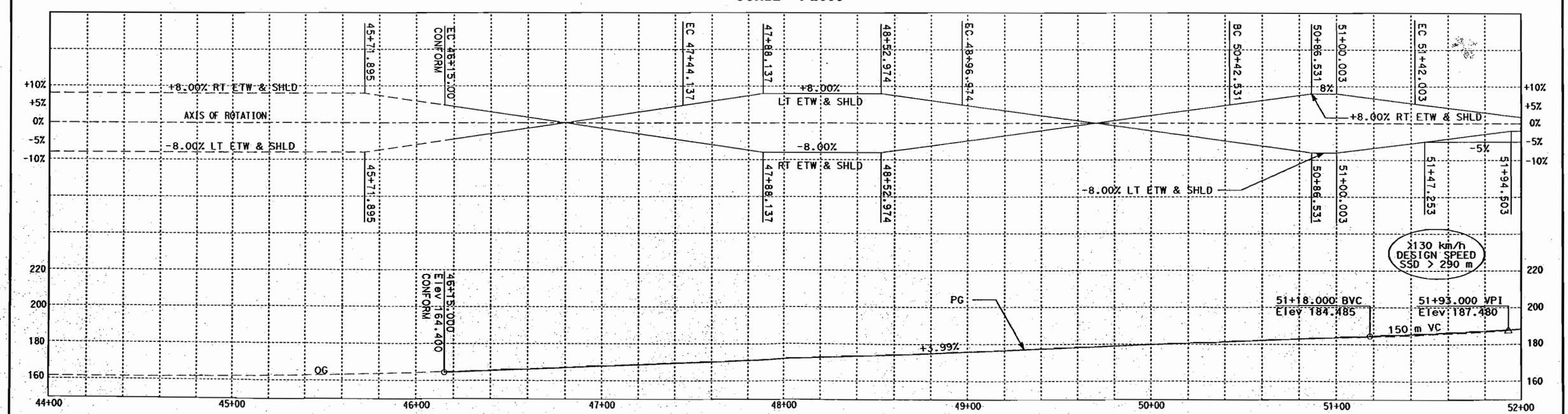

PROFILE AND SUPERELEVATION DIAGRAM

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ROUTE 84
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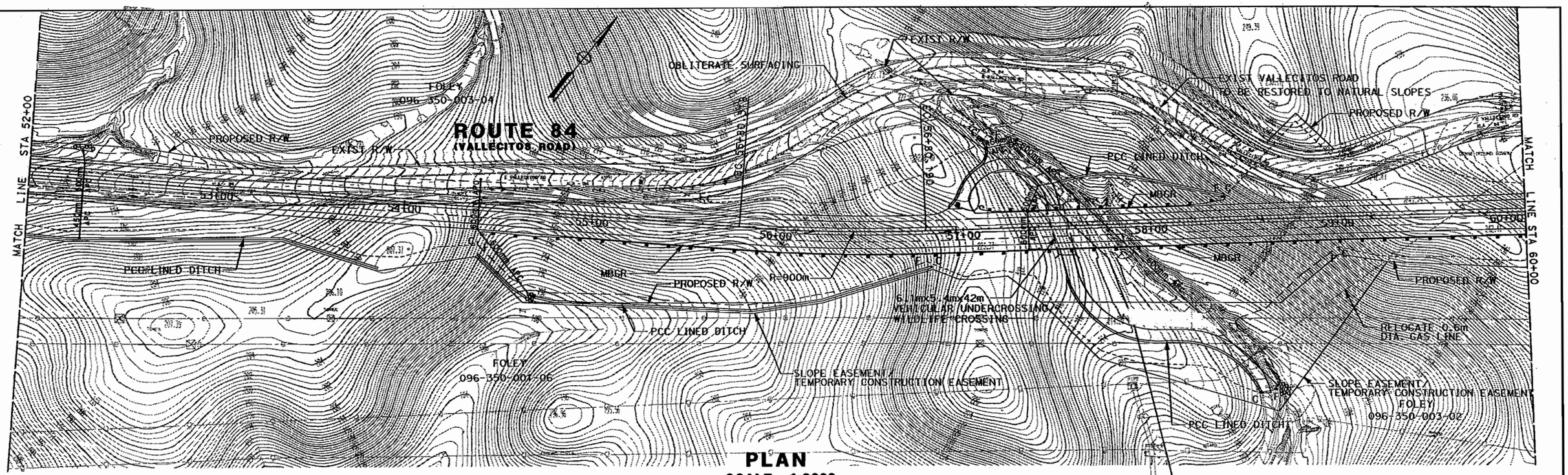

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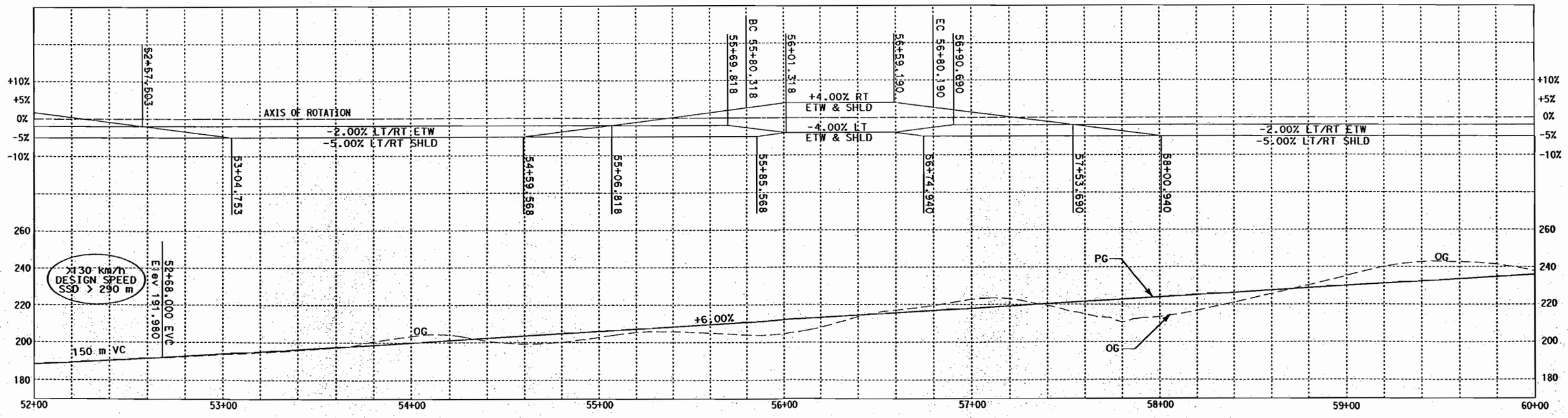

PROFILE AND SUPERELEVATION DIAGRAM

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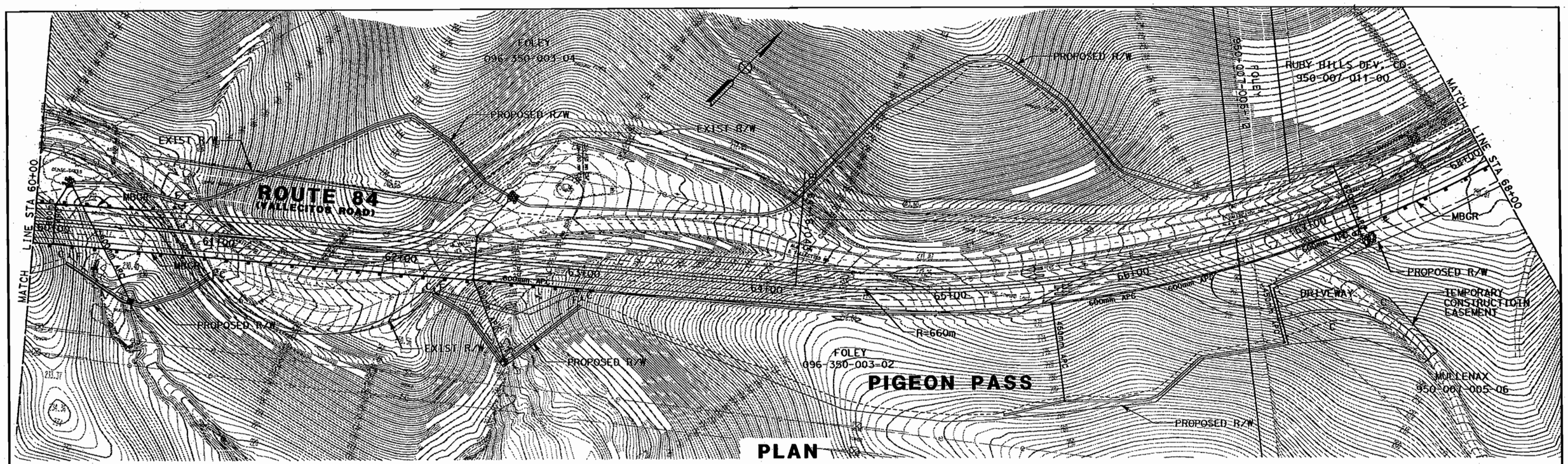

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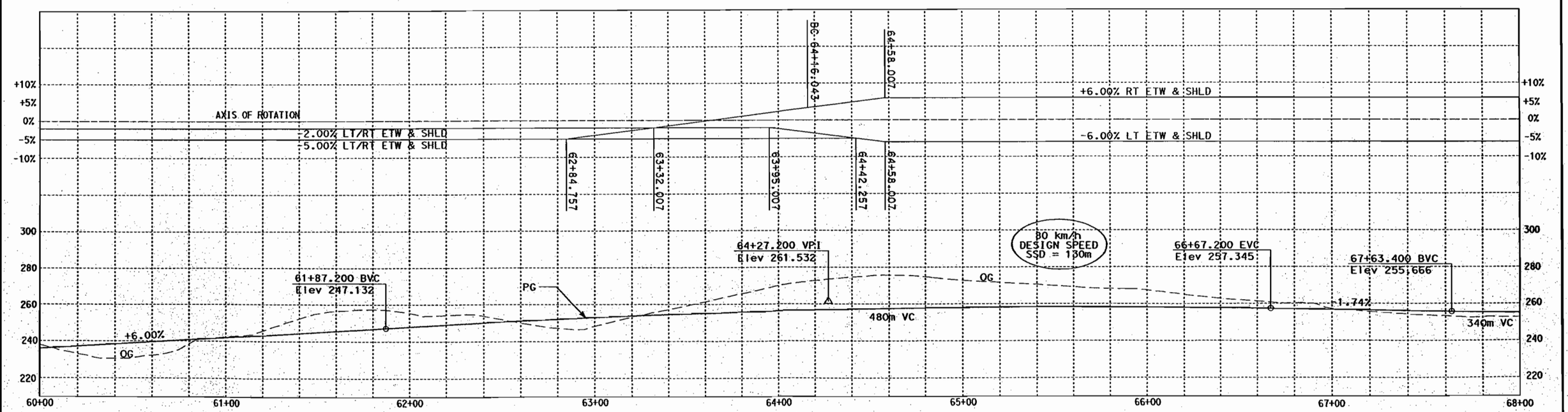

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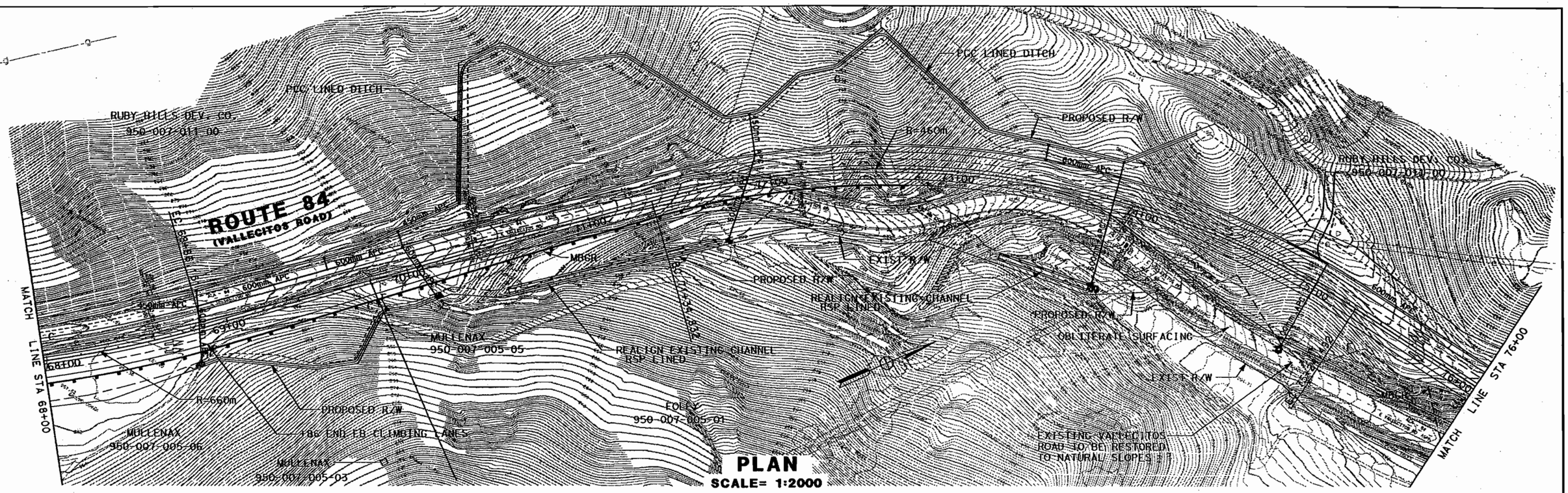

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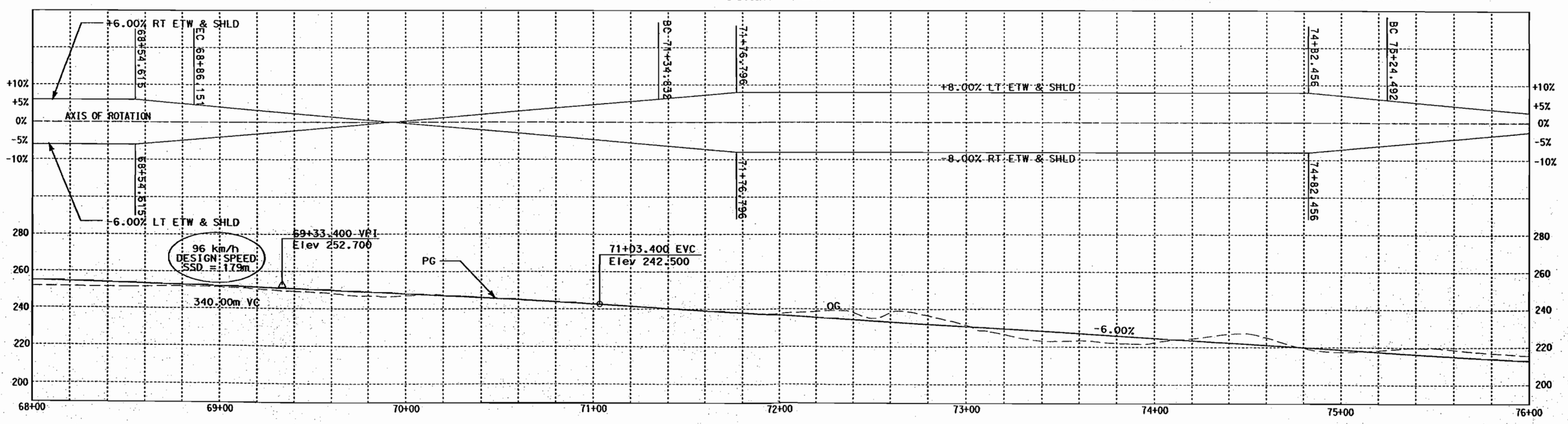

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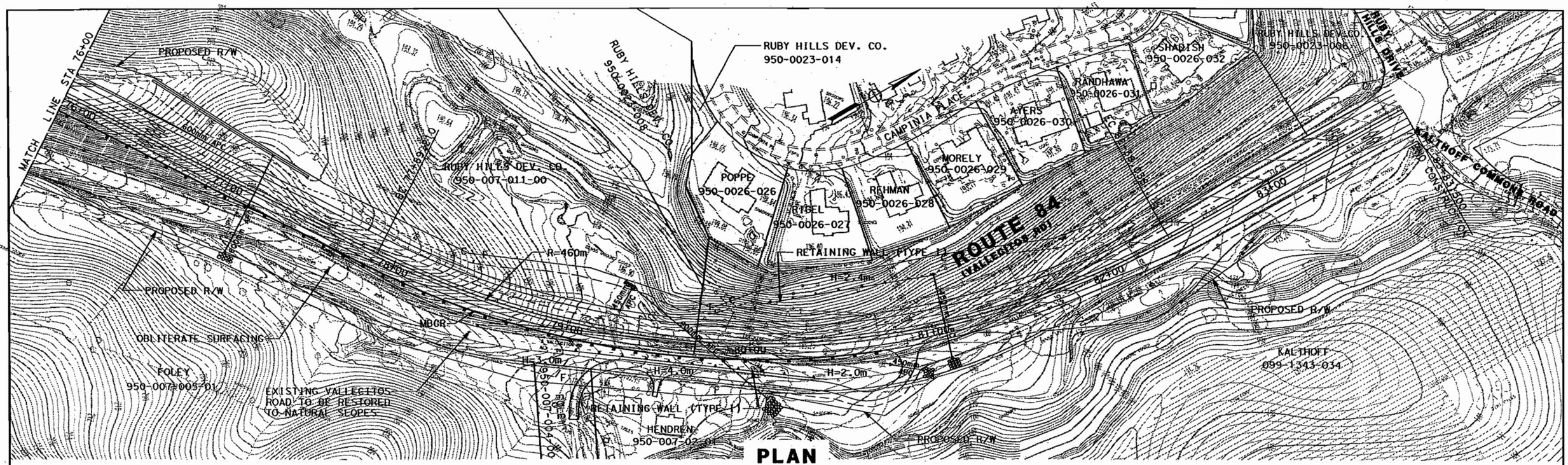

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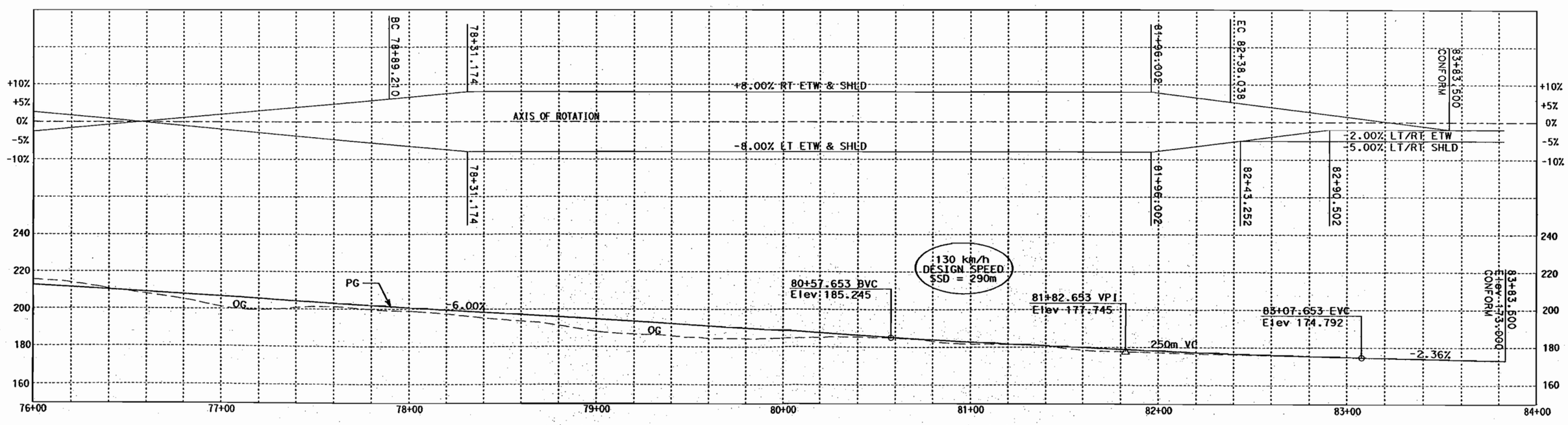

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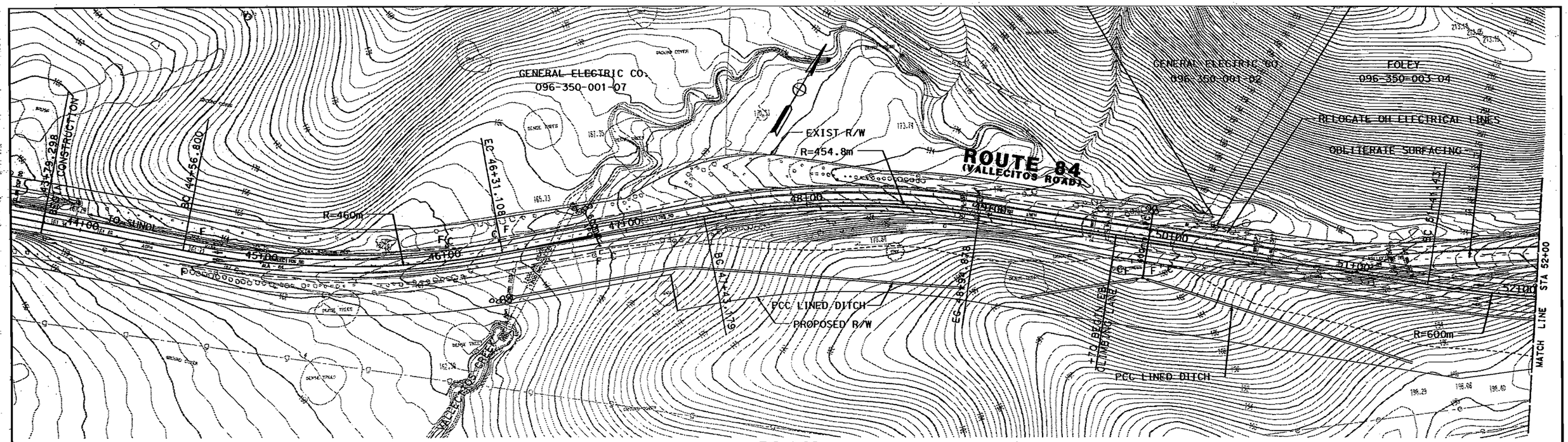

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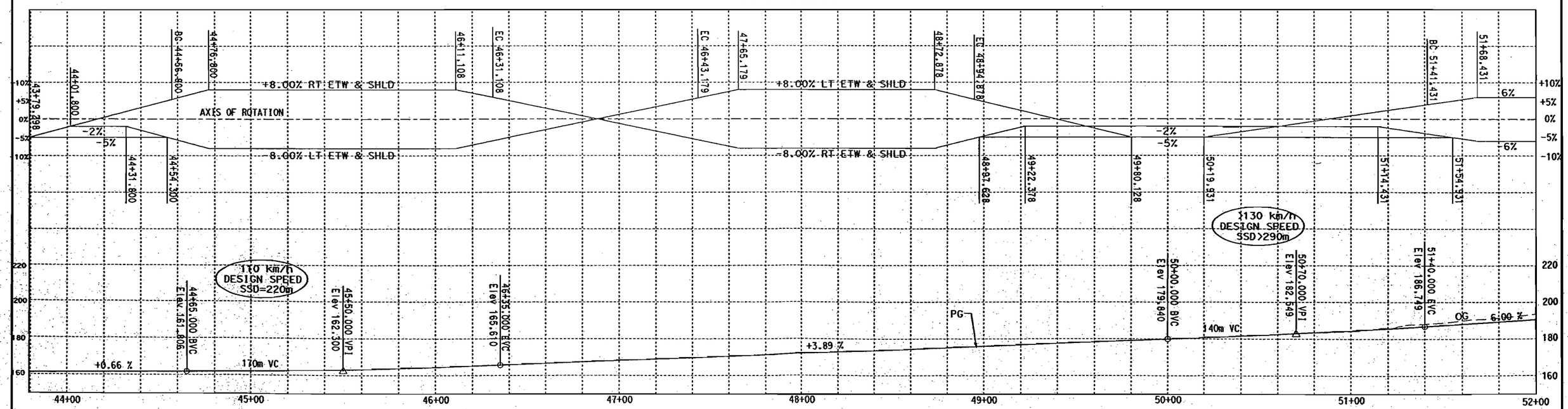

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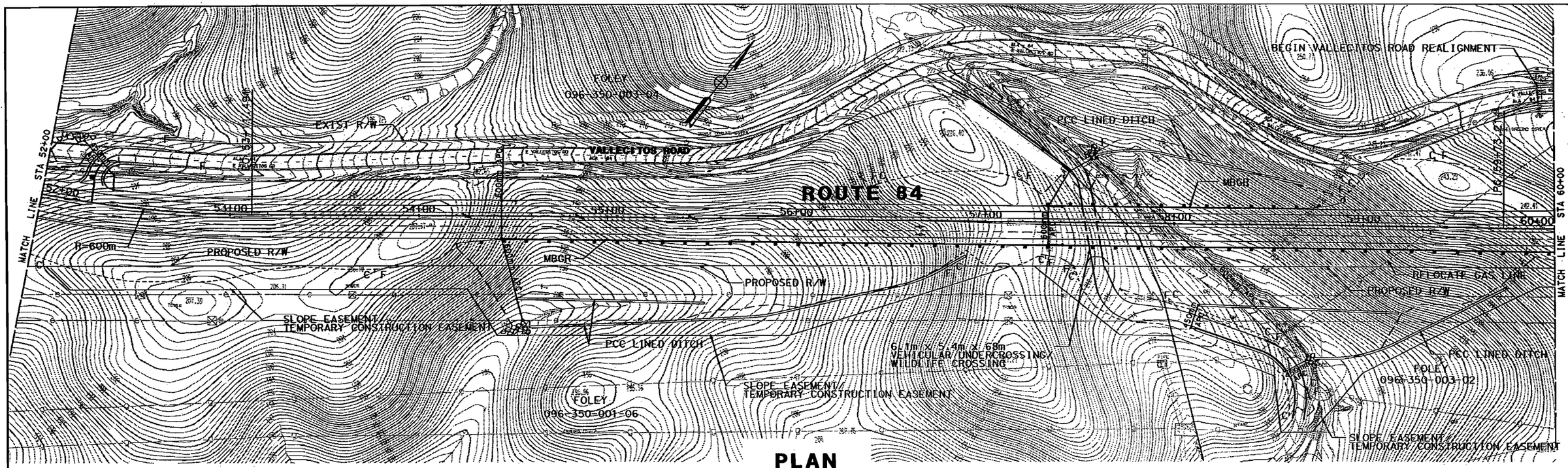

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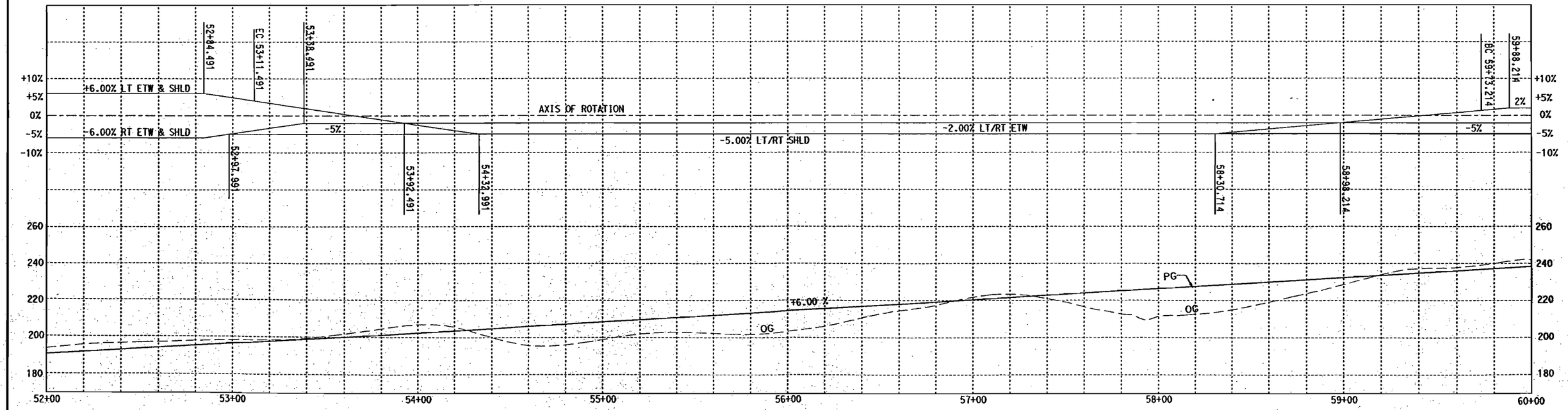

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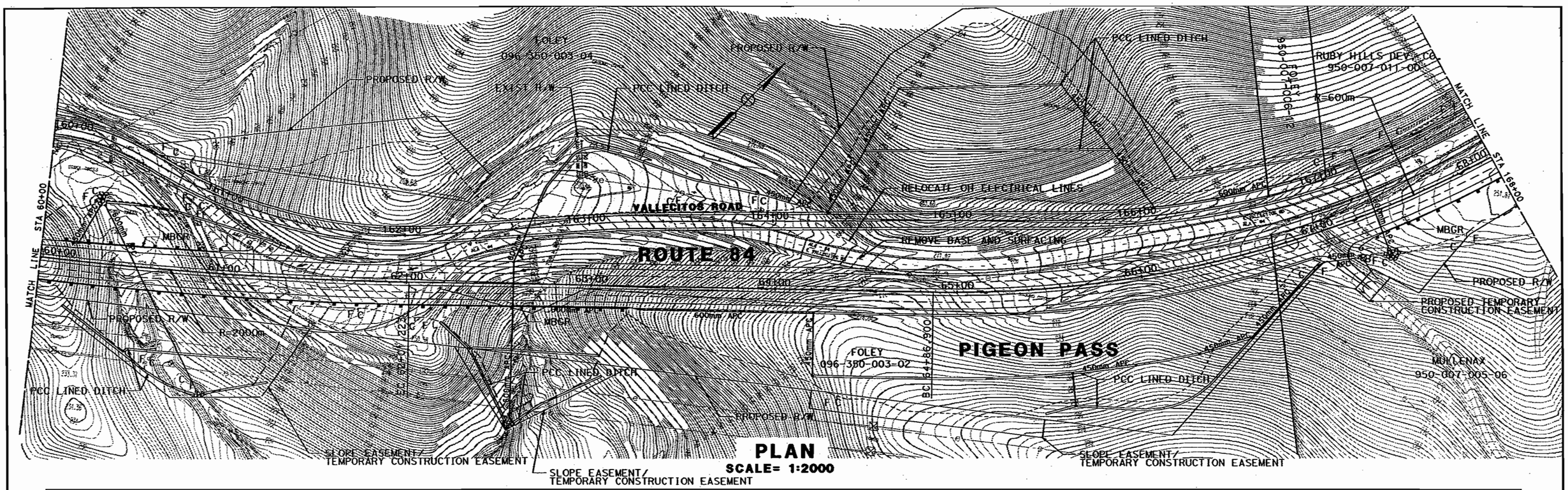

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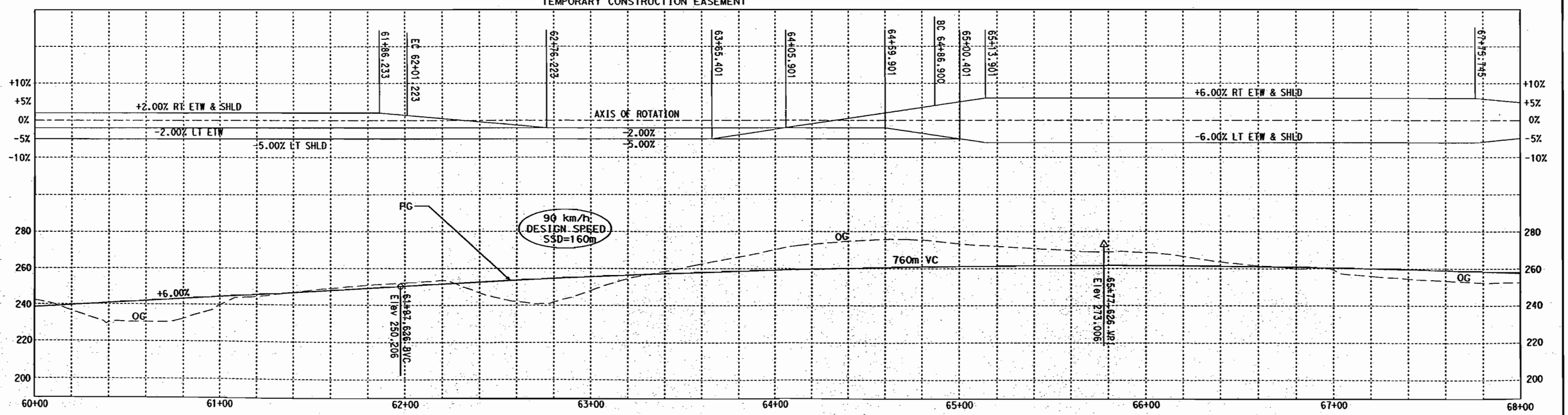

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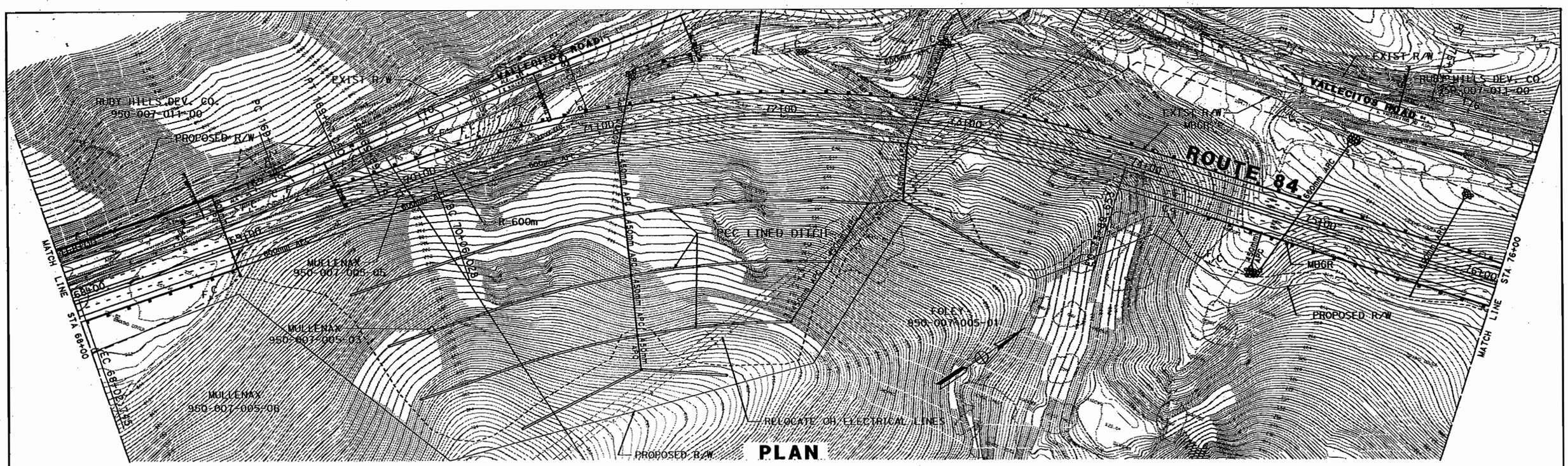

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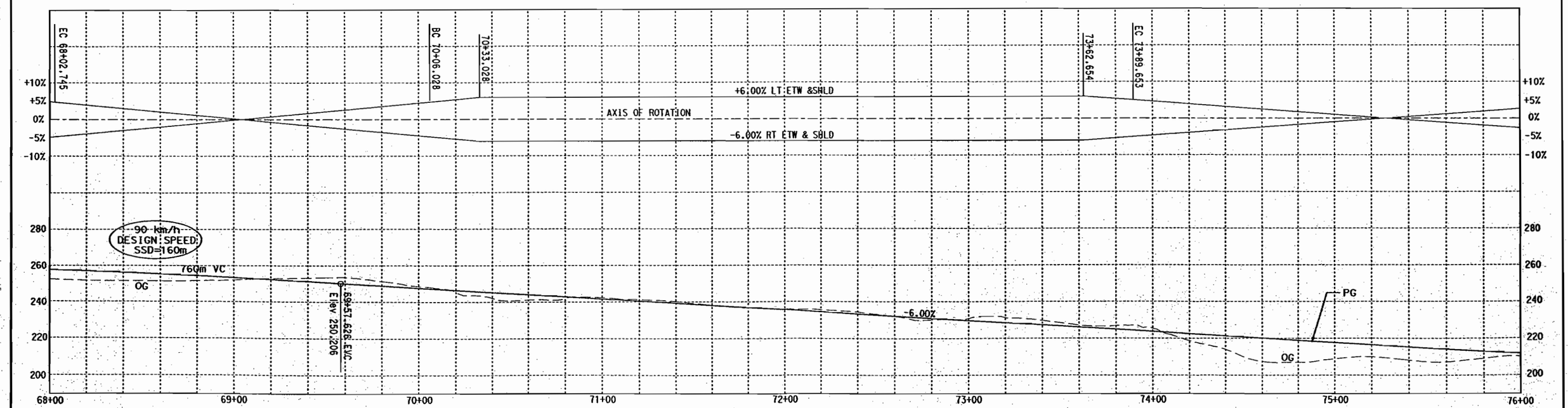

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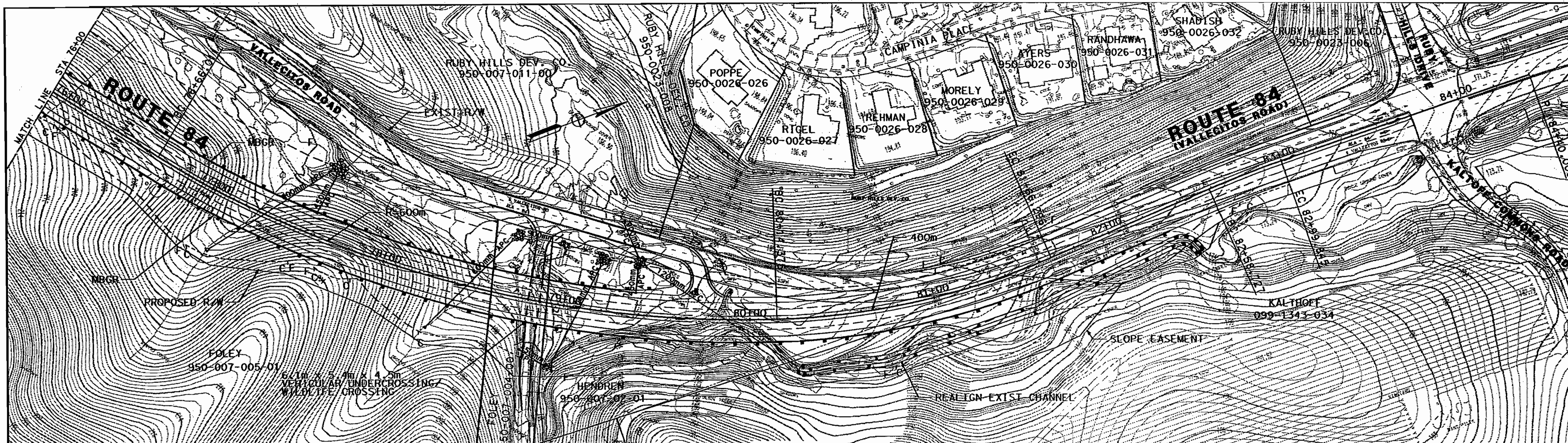

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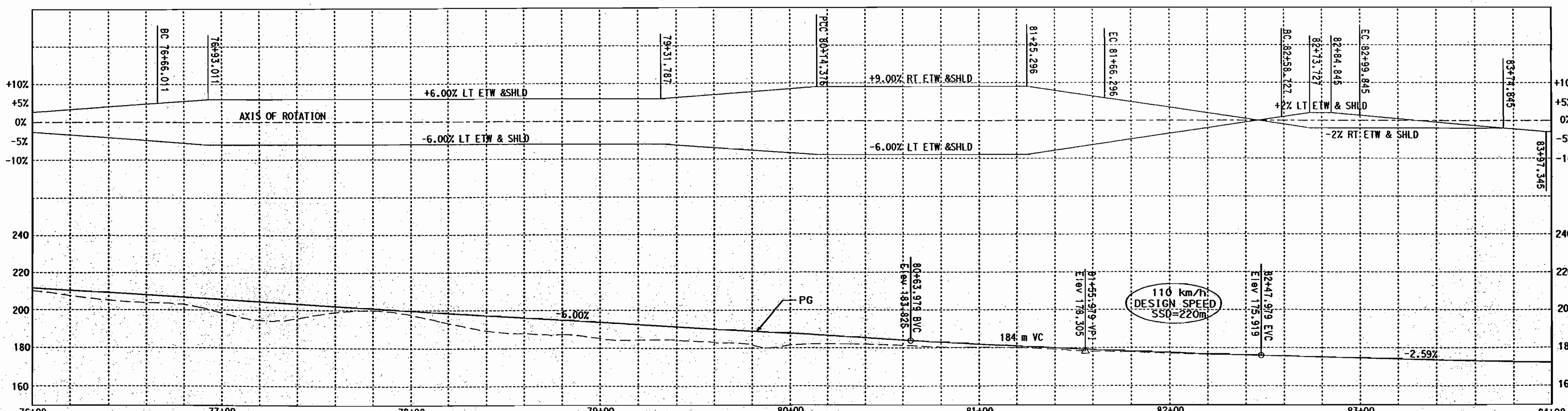

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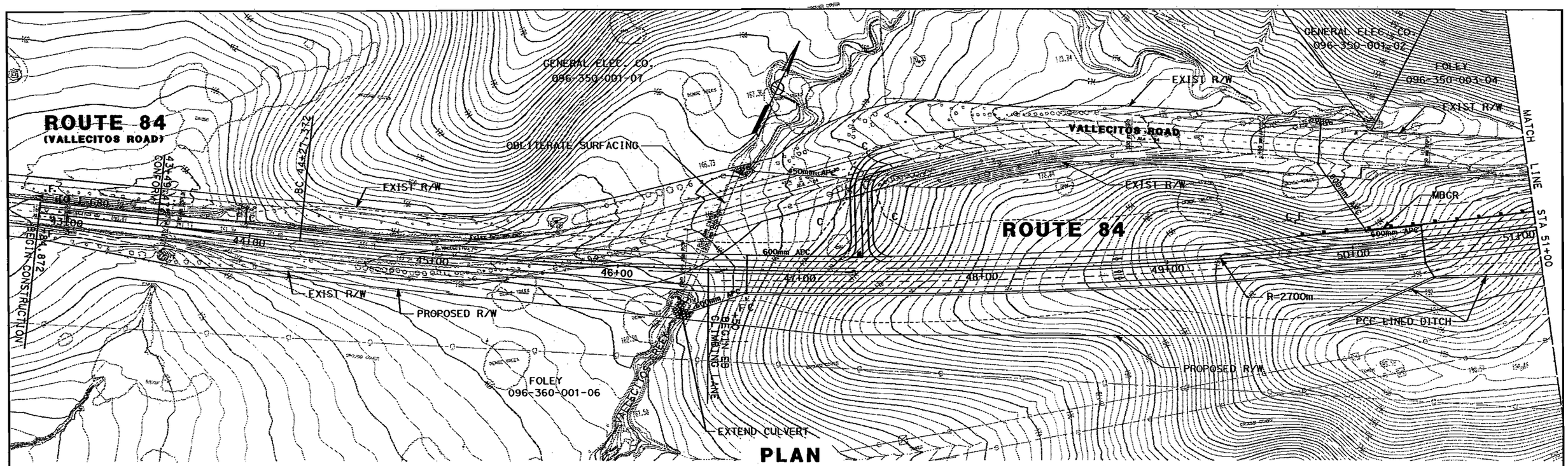

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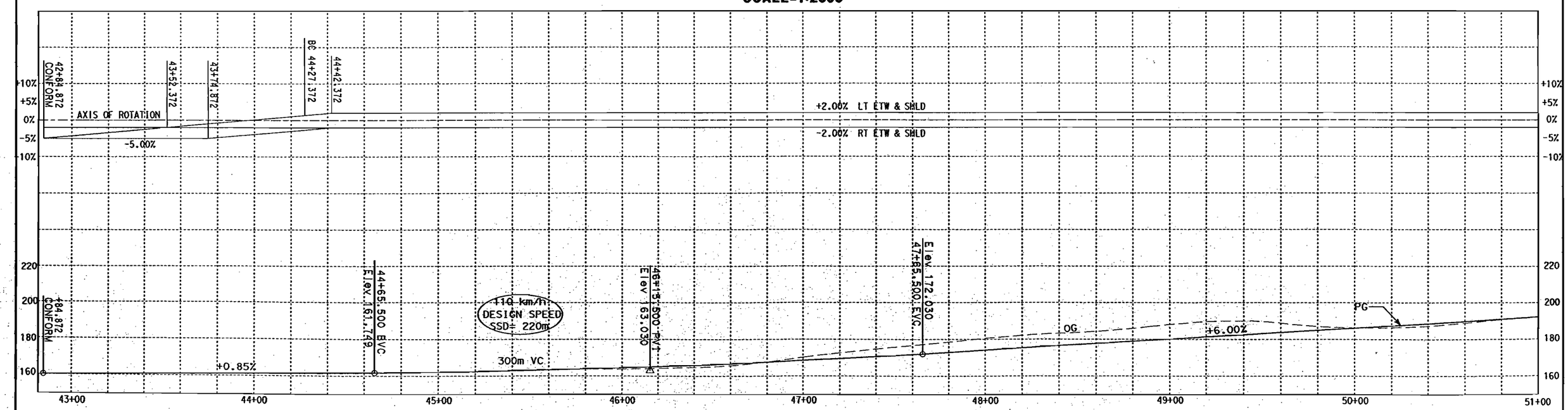

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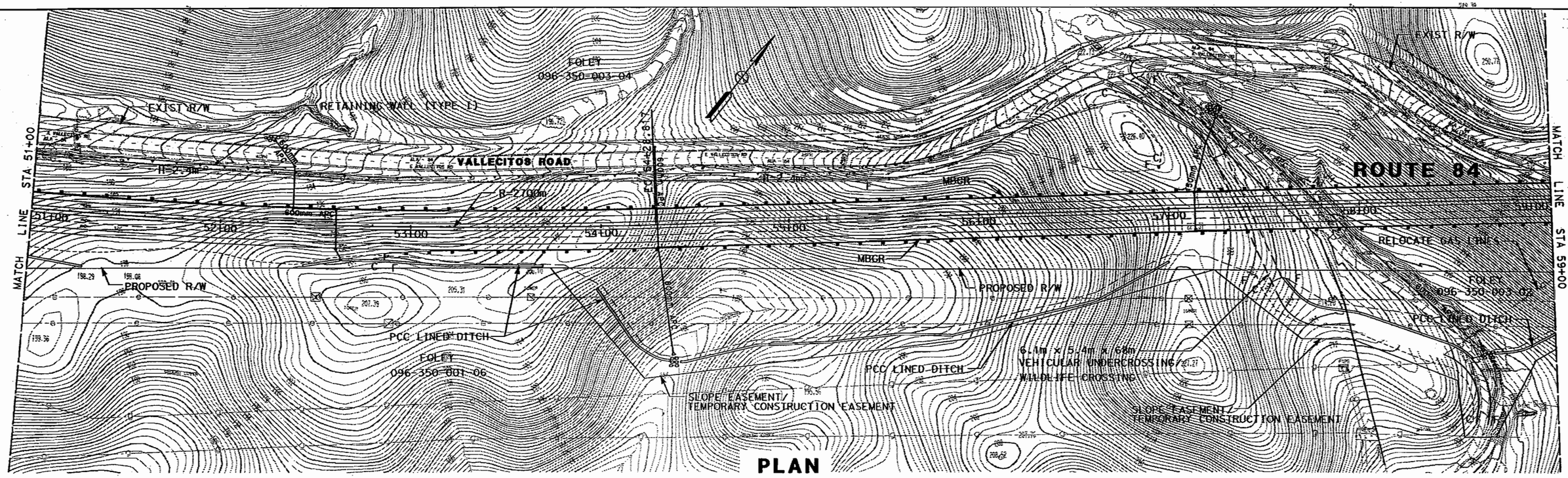

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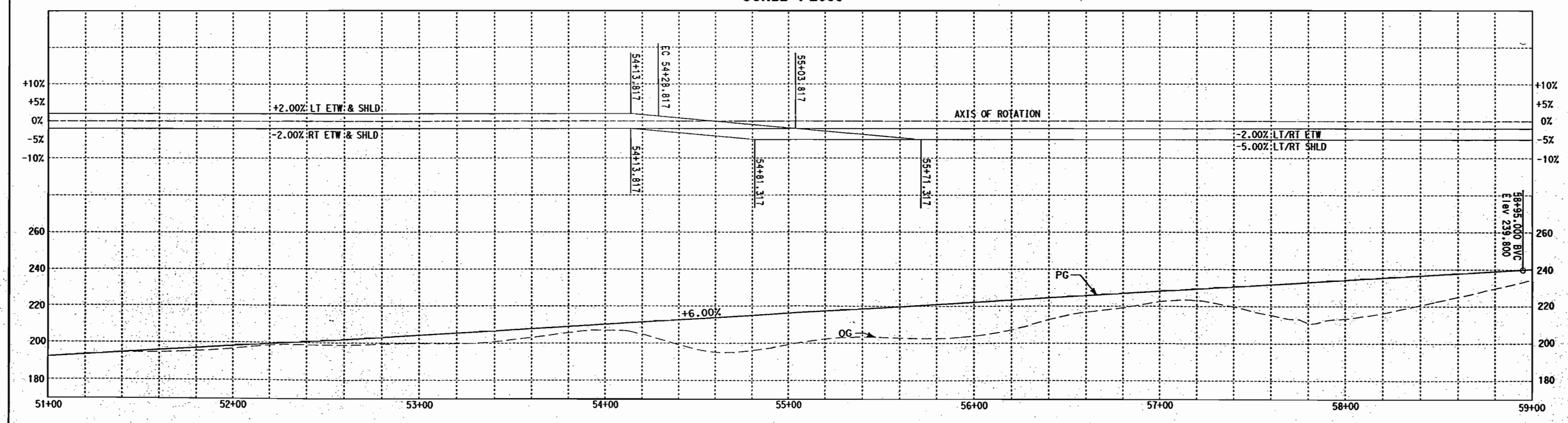

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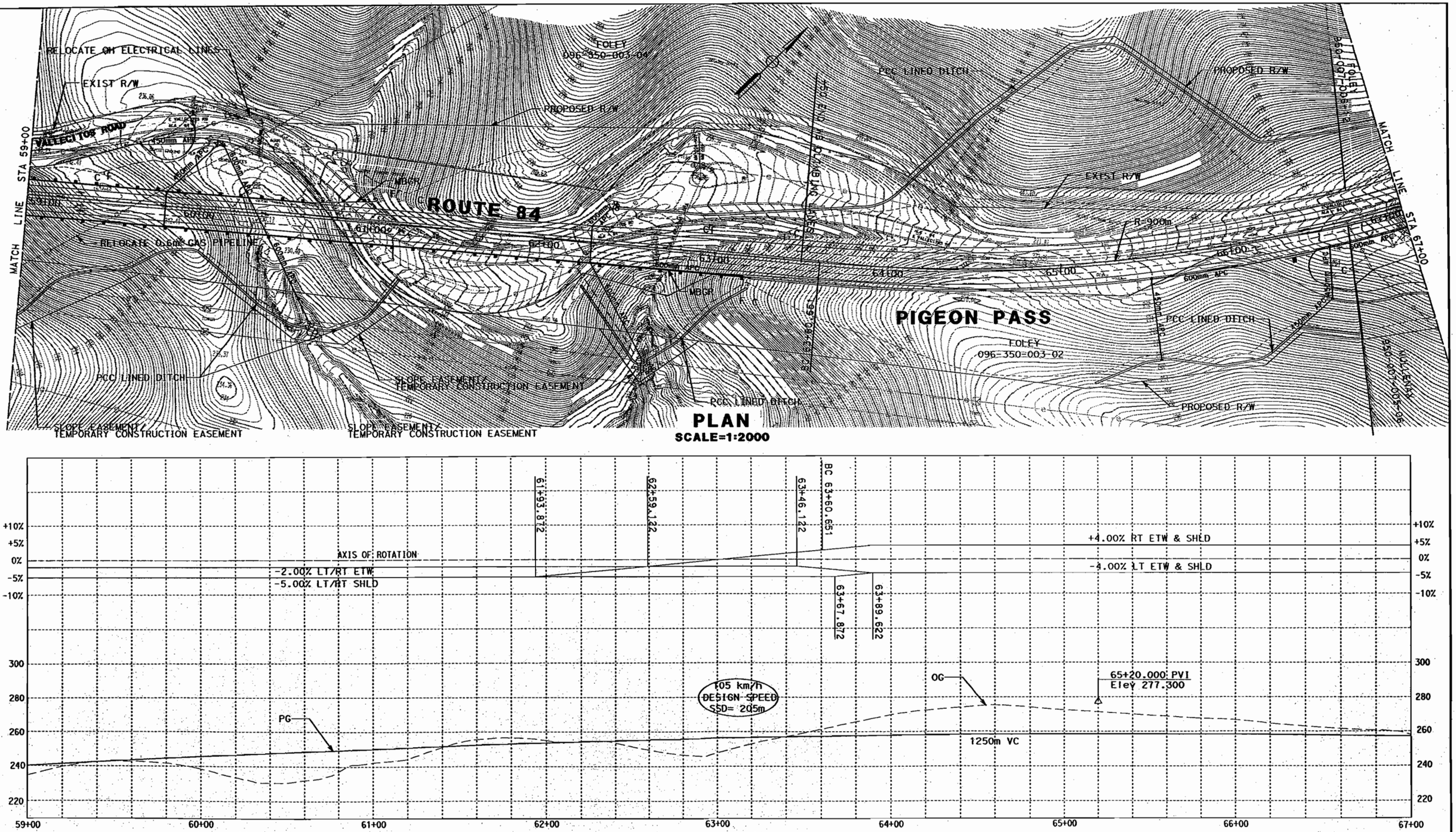

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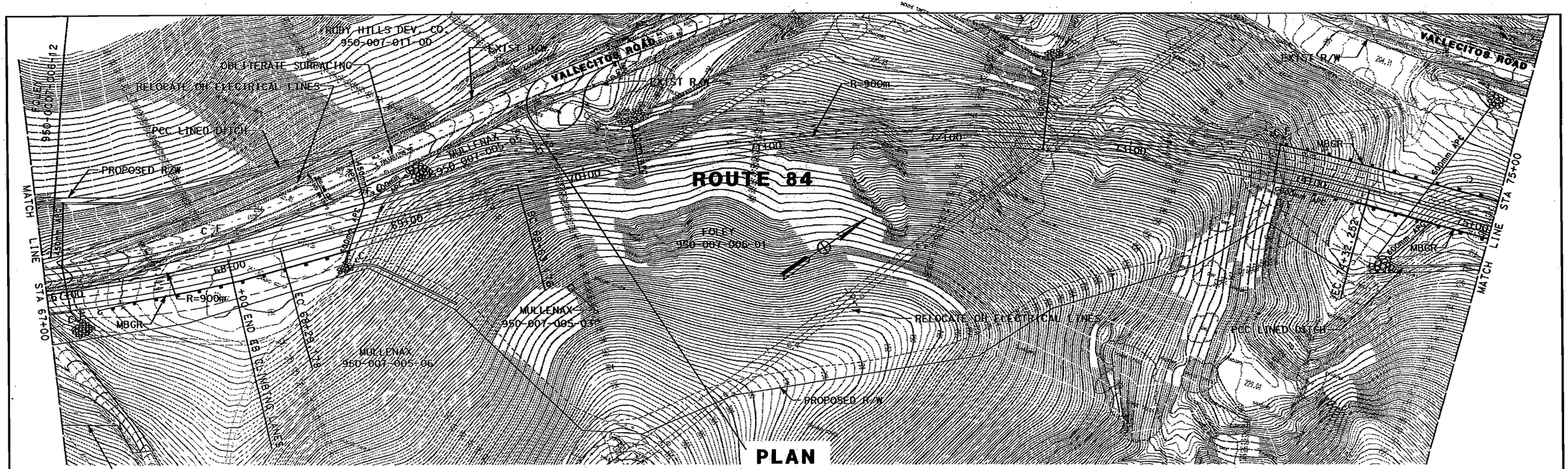

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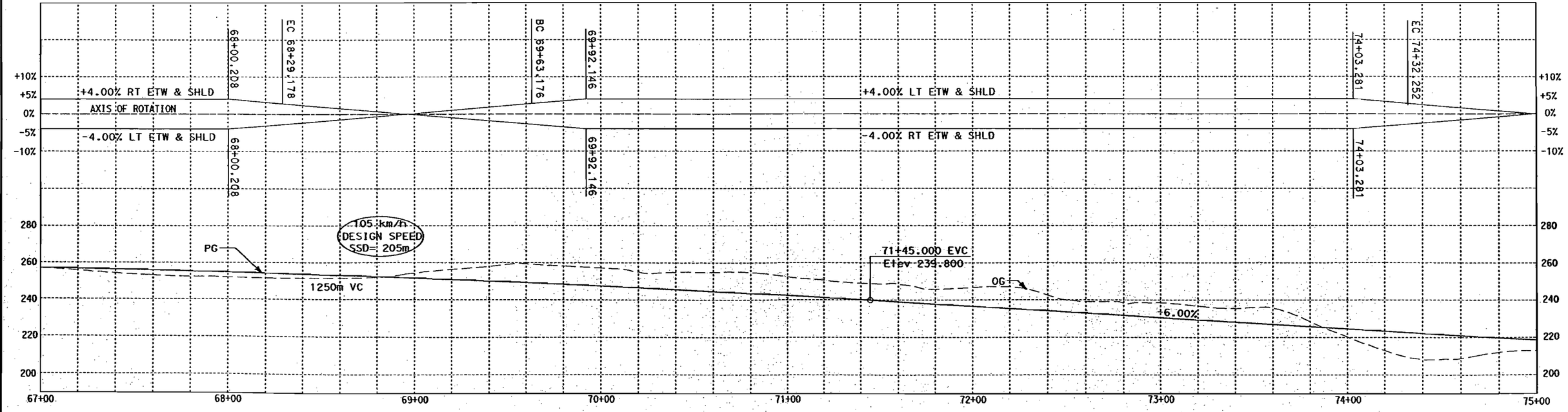

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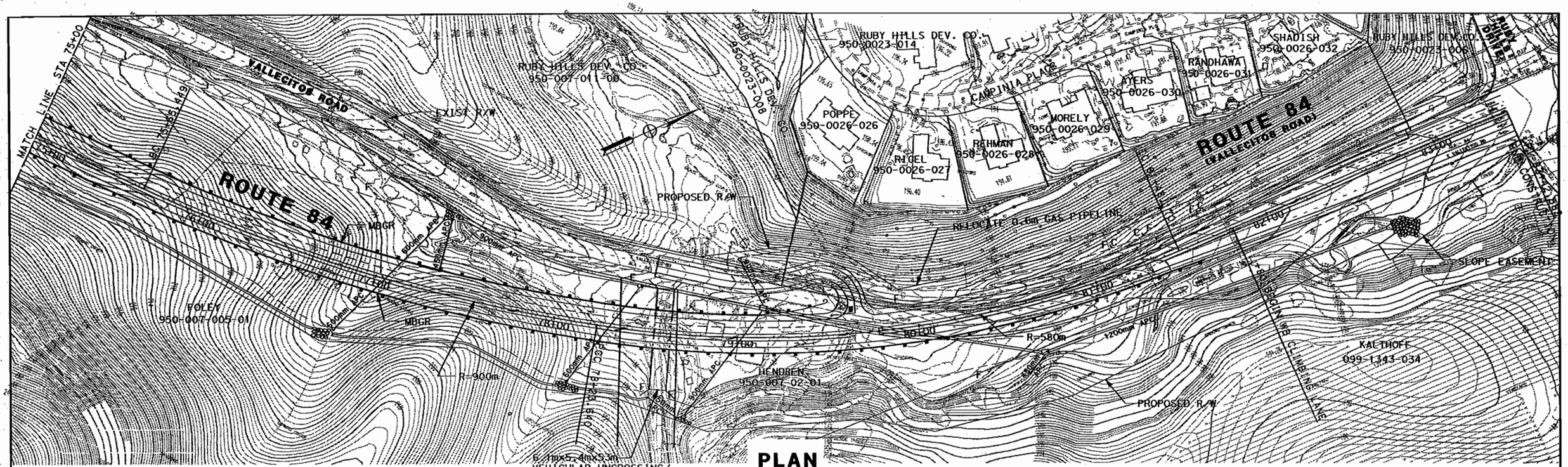

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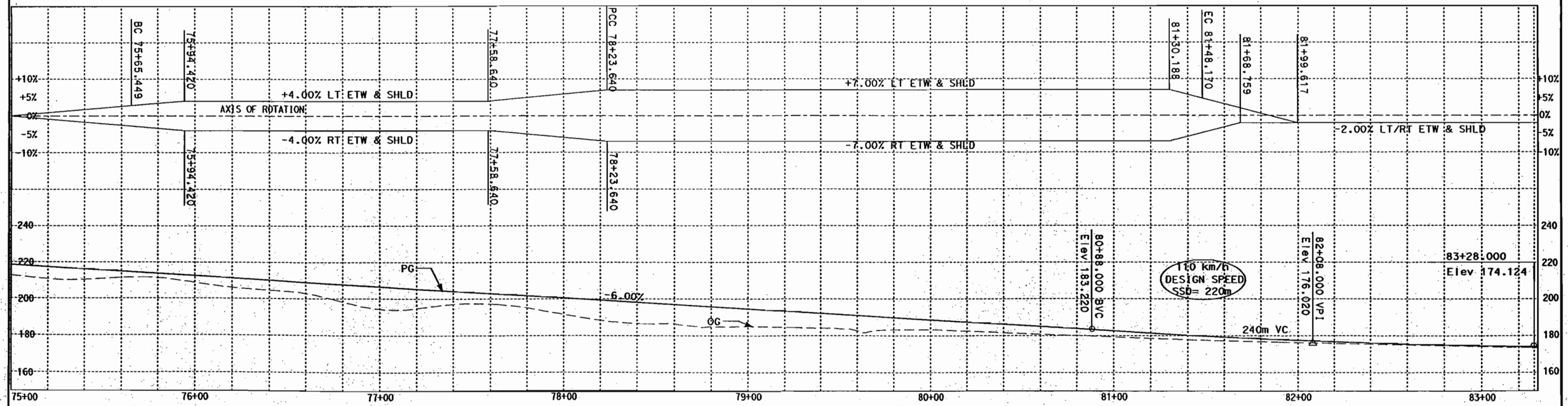

PROFILE AND SUPERELEVATION DIAGRAM

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SHEET 5 OF 5

Appendix E

USFWS Biological Opinion

Caltrans

Appendix E USFWS Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
1-1-04-F-0115

February 28, 2005

Mr. Gene Fong
Federal Highway Administration
Department of Transportation
650 Capital Mall, Suite 4-100
Sacramento, California 95814

Subject: Biological Opinion and Conference Opinion on the Proposed Pigeon Pass Curve Realignment, Southwest of Livermore, Alameda County, California

Dear Mr. Fong:

This is in response to your February 17, 2004, request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed addition of truck climbing lanes and curve corrections to State Route 84 (Pigeon Pass) in Alameda County, California. Your request was received in this Field Office on February 18, 2004. This document represents the Service's biological opinion on the effects of the action on the endangered San Joaquin kit fox (*Vulpes macrotis mutica*), threatened California red-legged frog (*Rana aurora draytonii*), threatened California tiger salamander (*Ambystoma californiese*), threatened vernal pool fairy shrimp (*Branchinecta lynchi*); and conference opinion on the effects of the action on the proposed critical habitats for the California tiger salamander and the California red-legged frog. This document is issued pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

This biological opinion is based on: (1) a letter from the Federal Highway Administration to the Service dated February 17, 2004; (2) *Early Evaluation for the San Joaquin Kit Fox for the Pigeon Pass Curve Correction Project* dated August 22, 2002, that was prepared by the California Department of Transportation; (3) *Biological Assessment Pigeon Pass Curve Realignment, Alameda County State Route 84, southwest of Livermore, Ca 04-Ala-84-33.3-37.0 (20.6-23.0) 04-172400* (Biological Assessment) dated February 2004, that was received by the Service on February 18, 2004; (4) *Large Branchiopod Dry (2002) and Wet (2002-2003) Season Surveys Caltrans SR 84 Curve realignment Project* dated May 2003 that was prepared by URS; (5) a visit to the project site by Chris Nagano of the Service on November 8, 2004; (6) a meeting

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on November 9, 2004, between Cay Goude and Susan Moore of the Service, and Gary Winters, Susan Chang, and Jeff Jensen of the California Department of Transportation; (7) a telephone conference between Chris Nagano, and John Webb, Shanna Zahner, Jeanie Baker, and Chris Collison on November 18, 2004; (8) a letter from the California Department of Transportation to the Service dated November 18, 2004; a meeting between Chris Nagano, Cay Goude, Susan Moore, Catrina Martin, and Jim Browning of the Service and Jeff Jensen, Chuck Morton, and other staff of the California Department of Transportation; (9) a e-mail dated December 15, 2004, from Chris Collision of the California Department of Transportation to the Service; (10) a letter from the California Department of Transportation to the Service dated February 15, 2005; (11) e-mail and telephone conversations between the California Department of Transportation and the Service; and (12) other information available to the Service.

CONSULTATION HISTORY

August 29, 2002:	The Service received the *Early Evaluation for the San Joaquin Kit Fox for the Pigeon Pass Curve Correction Project.*
September 19, 2002:	Heather Bell and Adam Zerrenner of the Service met with Shanna Zahner of the California Department of Transportation to discuss the San Joaquin kit fox.
February 18, 2004:	A letter requesting initiation of formal consultation dated February 17, 2004, and the Biological Assessment from the Federal Highway Administration were received by the Service.
August 11, 2004:	Ann Bowers of the Service met with Shanna Zahner of the California Department of Transportation to discuss the San Joaquin kit fox, California tiger salamander, and California red-legged frog.
October 4, 2004:	Shanna Zahner advised the Service that nighttime construction may be necessary to complete the action within three construction seasons.
November 8, 2004:	Chris Nagano of the Service conducted a field visit at the proposed project site.
November 9, 2004:	Susan Moore and Cay Goude of the Service, and Gary Winters, Susan Chang and Jeff Jensen of the California Department of Transportation discussed the proposed project.
November 18, 2004:	Chris Nagano, and John Webb, Shanna Zahner, Jeanie Baker, and Chris Collision of the California Department of Transportation discussed the proposed project on the telephone.
November 18, 2004:	The California Department of Transportation sent a letter dated November 18, 2004, via e-mail to the Service that stated they will provide protection in perpetuity for habitat affected by the proposed project (3:1 for permanent loss; 1.1 for temporary loss; temporary impacts to California red-legged frog would be restored on-site).
November 18, 2004:	The Service sent an e-mail to the California Department of Transportation requesting habitat protection in perpetuity be provided for the loss of California red-legged frog habitat, and an assessment of effects to the habitat of this species in the southern portion of the proposed project.

November 23, 2004:	In response to a request from the Service, the California Department of Transportation sent an e-mail of a photo and plans for the driveway undercrossings of State Route 84.
November 20, 2004:	The Service sent the California Department of Transportation an e-mail request for additional information on the culvert undercrossings intended for wildlife at the proposed project.
November 25, 2004:	The Service sent the California Department of Transportation an e-mail request for additional information on the lighting that will be used at the proposed project due to the potential effect on the nocturnal activities of the fox, frog, and salamander.
November 28, 2004:	The Service sent the California Department of Transportation an e-mail request for additional information on the vernal pools that will be affected by the proposed project.
December 5, 2004:	The California Department of Transportation sent an e-mail containing portions of the information that the Service had requested in order to compete the analysis necessary for the formal consultation.
December 8, 2004:	Chris Nagano, Cay Goude, Susan Moore, Catrina Martin, and Jim Browning of the Service discussed the project with Jeff Jensen, Chuck Morton, and other members of the California Department of Transportation. The California Department of Transportation stated they would compensate for the adverse effects of the project on the San Joaquin kit fox, California red-legged frog, California tiger salamander, and the vernal pool fairy shrimp.
December 14, 2004:	The California Department of Transportation sent an e-mail containing portions of the information that the Service had requested in order to compete the analysis necessary for the formal consultation.
December 15, 2004:	Chris Collision of the California Department of Transportation sent an e-mail to Chris Nagano of the Service stating that the Marysville office of the California Department of Transportation, not their Oakland office, was responsible for all negotiations and decisions on the formal consultation on the Pigeon Pass Project.
December 20, 2004:	The Service sent an e-mail to the California Department of Transportation requesting information on night lighting, vernal pools, and the California red-legged frog at the project site.
January 7, 2005:	Chris Nagano, Wayne White, Susan Moore, and Cay Goude discussed the proposed project with Susan Chang and Jeff Jensen of the California Department of Transportation.
February 15, 2005:	The Service received a letter from Susan Chang of the California Department of Transportation regarding the habitat for the California tiger salamander, California red-legged frog, San Joaquin kit fox, and the vernal pool fairy shrimp that will be protected as compensation for adverse effects resulting from the proposed project.

BIOLOGICAL OPINION

Description of Proposed Action

It is our understanding, the Pigeon Pass Project is intended to correct existing horizontal and vertical alignment deficiencies on State Route 84 south of Livermore in Alameda County, California. The purpose of the project is to improve safety and traffic operations by realigning and adding truck climbing lanes through the Vallecitos Hills/Pigeon Pass area, thereby reducing the accident rate for this corridor.

The westbound truck-climbing lane would begin west of the signalized intersection at Ruby Hills Drive/State Route 84 and continue approximately 1600 feet west of the crest in the vertical profile of Pigeon Pass. The eastbound truck-climbing lane begins prior to the 6% uphill grade west of Pigeon Pass and continues over Pigeon Pass to the intersection of Ruby Hills Drive. There will be a 11.8 feet wide paved median, intended to function as a left turn and acceleration lane. The paved width of the new alignment will vary from 43.3 to 78.7 feet, and from Pigeon Pass to the west end it varies from 78.7 to 43.3 feet. The project requires the relocation of a 2 foot diameter natural gas transmission pipeline located approximately 1,792 feet west of Pigeon Pass. The earthwork is balanced, and therefore, a disposal site is not necessary. Approximately 17,655,367 cubic feet will be excavated and reused as fill within the cut and fill units.

Construction of the project is expected to begin in 2005 and be complete by 2007. It will most likely be constructed in three phases. The first phase will include construction of the westerly two-thirds of the frontage road (private landowner access) and temporary detour; the second phase will include constructing the last one-third of the frontage road, removal of temporary detour, and completing the conforms. The third phase will include constructing the last one-third of the frontage road, removal of temporary detour, and completing the conforms. At this time blasting and pile driving activities are not expected. Equipment used to perform the work could include, but is not limited to, scrapers, dozers, graders, and dump trucks. Nighttime construction of an unknown duration and extent will be conducted at the project site.

<u>Avoidance and Protection Measures – Listed Species</u>

According to the Biological Assessment, the February 15, 2005, letter from California to the Service, and other information available to the Service, the California Department of Transportation proposes to avoid, minimize, and compensate for effects to listed species through the following measures:

1. No ground disturbing activities will be conducted between October 31st and March 1st outside the limits of the established road bed. Established roadbeds include all pre-existing and project-constructed unimproved, as well as, improved roads.

2. The potential for adverse effects caused by poor water quality will be avoided by implementing temporary and permanent Best Management Practices outlined in section 7-7.01G of the California Department of Transportation's Standard Specifications.

3. The contractor shall be required to submit a Storm Water Pollution Prevention Plan as required by the National Pollutant Discharge Elimination System permit.

4. Additional water quality protection measures required by other permits such as the California Department of Fish and Game's Lake and Streambed Alteration Agreement will be implemented.

5. Twelve drainage culverts and two driveway under crossings will be installed throughout the project area, which can provide a method of crossing under the new highway.

6. A qualified biologist shall be on-site or on-call during all activities that could result in the take of listed species. The qualification of the biologist(s) shall be presented to the Service for review and approval at least 60 calendar days prior to any groundbreaking at the project site. The biologist(s) shall be given the authority to stop any work that may result in the take of listed species. If the biologist(s) exercises this authority, the Service and the California Department of Fish and Game shall be notified by telephone and electronic mail within one (1) working day. The Service contact is the Deputy Assistant Field Supervisor, Endangered Species Program at the Sacramento Fish and Wildlife Office at telephone 916/414-6600.

7. Environmentally sensitive areas (ESAs) will be established, and marked in the field with standard orange mesh ESA fencing, around known avoidable vernal pools, amphibian breeding and aestivation areas, and any active, or potentially active, kit fox dens. Under the direction of the California Department of Transportation Resident Engineer, with the aid of the Service approved biologist, the ESA fence will be erected around the ESAs to prevent areas from being disturbed during construction.

8. The limits of the construction area will be flagged, if not already marked by right of way, or other, fencing, and all activity will be confined within the marked area. All access to and from the project area will be clearly marked in the field with appropriate flagging and signs. Prior to commencing construction activities, the contractor will determine construction vehicle parking and all access.

9. Project-related vehicles shall observe a 20-mile per hour speed limit in all project areas, except on county roads and State and Federal highways; this is particularly important at night when California red-legged frogs, California tiger salamanders, and kit foxes are most active.

10. To the extent possible, nighttime construction should be minimized. Construction crews will be informed during the education program meeting that, to the extent possible, travel within the marked project site will be restricted to established roadbeds. Established roadbeds include all pre-existing and project-constructed unimproved, as well as, improved roads.

11. An employee education program shall be conducted, consisting of a brief presentation by persons knowledgeable in vernal pool, California tiger salamander, red-legged frog, and kit fox biology and legislative protection to explain endangered species concerns to contractors, their employees, and any other personnel involved in the project. The program should include the following: a description of the species and their habitat needs; a report of the occurrence of these species in the project area; an explanation of the status of these species and their protection under the Endangered Species Act; and a list of measures being taken to reduce impacts to the species during project construction and implementation. A fact sheet conveying this information should be prepared for distribution to the above-mentioned people and anyone else who may enter the project site. Upon completion of training, employees will sign a form stating that they attended the training and understand all the conservation and protection measures.

12. For compensation for permanent and temporary loss of habitat listed below, where habitat is suitable for both the San Joaquin kit fox and the California tiger salamander, its preservation may be counted toward the preservation of both species.

13. The California Department of Transportation will divide the 132 acres of compensation habitat for the San Joaquin kit fox and the California tiger salamander by purchasing 80 credit acres for the California tiger salamander and providing payment for 52 acres into the Service's San Joaquin Kit Fox Fund. The California Department of Transportation is proposing to purchase 80 acres of conservation credits at the Ohlone Conservation Bank. The California Department of Transportation will pay $650,000.00 (52 acres x $12,500/acre) into the San Joaquin Kit Fox Fund.

<u>Avoidance and Protection Measures - San Joaquin Kit Fox</u>

1. Preconstruction/pre-activity surveys shall be conducted by a Service approved biological monitor according to the *Standard Recommendation for the Protection of the San Joaquin kit fox Prior to or During Ground Disturbance* (Standard Recommendations) (U.S. Fish and Wildlife Service 1997) no less than 14 days and no more than 30 days prior to the beginning of project implementation. Surveys shall identify kit fox habitat features on the project site and evaluate use by kit fox and, if possible, and assess the potential impacts to the kit fox by the proposed activity. The status of all dens should be determined and mapped in accordance with the survey protocol.

2. Written results of preconstruction/pre-activity surveys must be received by the Service within five days after survey completion and prior to the start of ground disturbance and/or construction activities. If a natal/pupping den is discovered within the project area or within (200-feet) of the project boundary, the Service shall be immediately notified. In accordance with the Standard Recommendations, after preconstruction surveys, dens which are determined by California Department of Transportation to be unavoidable

during construction may be destroyed by excavation, with the exception of natal/pupping dens.

3. Following preconstruction den searches and excavations of unavoidable dens but before construction begins, the Resident Engineer, with the assistance of the Service approved biologist, will establish Environmentally Sensitive Areas around those kit fox dens which are determined by the California Department of Transportation to be reasonably avoidable. ESA radii will be: potential den = (50 feet); known den = (100 feet); natal or pupping den = to be determined on a case-by-case basis in coordination with the Service and the California Department of Fish and Game.

4. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than (2 feet) deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals.

5. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of (4-inches) or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes prior to commencing construction activities for the day, or, at the latest, before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe should not be moved until the Service has been consulted. If necessary, and under the direct supervision of the Service approved biological monitor, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

6. All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers and removed at least once a week from a construction or project site.

7. California Department of Transportation employees, contractors, and contractors' employees shall not have firearms on the project site. This shall not apply to authorized security personnel, or local, State, or Federal law enforcement officials.

8. The California Department of Transportation Resident Engineer is the point of contact in the event that any employee or contractor might inadvertently kill or injure a kit fox or who finds a dead, injured or entrapped individual. The Resident Engineer will be identified in the employee education program. The Resident Engineer's name and phone number will be provided to the Service.

9. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc. shall be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with the Service, California Department of Fish and Game, and revegetation experts.

Avoidance and Protection Measures - California Tiger Salamander

1. To minimize direct mortality to breeding adults and juveniles using the pool that will be filled, construction at the pool will be restricted to a period after the pool has completely dried (normally by mid-July).

Avoidance and Protection Measures - California Red-Legged Frog

1. A survey and relocation program for California red-legged frogs will be implemented no less than 14 days and no more than 30 days prior to the onset of construction. All red-legged frog habitat previously identified in the Biological Assessment will be surveyed for red-legged frogs by a Service approved biologist. If frogs are found they will be relocated to Ruby Hills/Vineyard Estates mitigation site, pending final written approval from the site managers. If final approval can not be obtained for the Ruby Hills/Vineyard Estates mitigation site, the California Department of Transportation will submit a new location for consideration. No relocation activities will begin until the California Department of Transportation has received written approval of the alternate relocation site from the Service. All biologists involved with the surveying/handling of the red-legged frogs will employ sterilization techniques appropriate to avoid the transmission of chytrid fungus to or from the site.

2. All fueling and maintenance of vehicles and other equipment and staging areas shall occur at least 60 feet from any riparian habitat or water body. The California Department of Transportation shall ensure contamination of habitat does not occur during such operations. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

3. Areas of red-legged frog habitat that are avoidable will be fenced with standard orange mesh Environmentally Sensitive Area fencing.

4. The California Department of Transportation will purchase 25 acres of California red-legged frog habitat. The Service has agreed that 25 acres of the 80 credit acres that will be purchased at the Ohlone Conservation Bank also will be credited towards the listed frog.

Avoidance and Protection Measures - Vernal Pool Fairy Shrimp

1. The California Department of Transportation will purchase 2.06 acres or 2.06 acre credits of habitat for the vernal pool fairy shrimp. The California Department of Transportation

   will ensure the Service approves of the means of compensation that will be used for this listed crustacean prior to construction.

STATUS OF SPECIES/ENVIRONMENTAL BASELINE

San Joaquin Kit Fox

The San Joaquin kit fox was listed as an endangered species on March 11, 1967 (U.S. Fish and Wildlife Service 1967) and it was listed by the State of California as a threatened species on June 27, 1971. The *Recovery Plan for Upland Species of the San Joaquin Valley, California* includes this listed canine (U.S. Fish and Wildlife Service 1998).

In the San Joaquin Valley before 1930, the range of the San Joaquin kit fox extended from southern Kern County north to Tracy in San Joaquin County, on the west side, and near La Grange in Stanislaus County, on the east side (Grinnell *et al.* 1937; U.S. Fish and Wildlife Service 1998). Historically, this species occurred in several San Joaquin Valley native plant communities. In the southernmost portion of the range, these communities included Valley Sink Scrub, Valley Saltbush Scrub, Upper Sonoran Subshrub Scrub, and Annual Grassland. San Joaquin kit foxes also exhibit a capacity to utilize habitats that have been altered by man. The animals are present in many oil fields, grazed pasturelands, and "wind farms" (Cypher 2000). Kit foxes can inhabit the margins and fallow lands near irrigated row crops, orchards, and vineyards, and may forage occasionally in these agricultural areas (U.S. Fish and Wildlife Service 1998). There are a limited number of observations of San Joaquin kit foxes foraging in trees in urban areas (Murdoch *et al.* 2005). The San Joaquin kit fox seems to prefer more gentle terrain and decreases in abundance as terrain ruggedness increases (Grinnell *et al.* 1937; Morrell 1972; Warrick and Cypher 1998).

Adult San Joaquin kit foxes are usually solitary during late summer and fall. In September and October, adult females begin to excavate and enlarge natal dens (Morrell 1972), and adult males join the females in October or November (Morrell 1972). Typically, pups are born between February and late March following a gestation period of 49 to 55 days (Egoscue 1962; Morrell 1972; Spiegel and Tom 1996; U.S. Fish and Wildlife Service 1998). Mean litter sizes reported for San Joaquin kit foxes include 2.0 on the Carrizo Plain (White and Ralls 1993), 3.0 at Camp Roberts (Spencer *et al.* 1992), 3.7 in the Lokern area (Spiegel and Tom 1996), and 3.8 at the Naval Petroleum Reserve (Cypher *et al.* 2000). Pups appear above ground at about age 3-4 weeks, and are weaned at age 6-8 weeks. Reproductive rates, the proportion of females bearing young, of adult San Joaquin kit foxes vary annually with environmental conditions, particularly food availability. Annual rates range from 0-100%, and reported mean rates include 61% at the Naval Petroleum Reserve (Cypher *et al.* 2000), 64% in the Lokern area (Spiegel and Tom 1996),

and 32% at Camp Roberts (Spencer *et al.* 1992). Although some yearling female kit foxes will produce young, most do not reproduce until age 2 years (Spencer et al. 1992; Spiegel and Tom 1996; Cypher *et al.* 2000). Some young of both sexes, but particularly females may delay dispersal, and may assist their parents in raising the following year's litter of pups (Spiegel and Tom 1996). The young kit foxes begin to forage for themselves at about four to five months of age (Koopman *et al.* 2000; Morell 1972).

Although most young kit foxes disperse less than 5 miles (Scrivner *et al.* 1987a), dispersal distances of up to 76.3 miles have been documented for the San Joaquin kit fox (Scrivner *et al.* 1993; U.S. Fish and Wildlife Service 1998). Dispersal can be through disturbed habitats, including agricultural fields, and across highways and aqueducts. The age at dispersal ranges from 4-32 months (Cypher 2000). Among juvenile kit foxes surviving to July 1 at the Naval Petroleum Reserve, 49% of the males dispersed from natal home ranges while 24% of the females dispersed (Koopman *et al.* 2000). Among dispersing kit foxes, 87% did so during their first year of age. Most, 65.2%, of the dispersing juveniles at the Naval Petroleum Reserve died within 10 days of leaving their natal home den (Koopman *et al.* 2000). Some kit foxes delay dispersal and may inherit their natal home range.

San Joaquin kit foxes are reputed to be poor diggers, and their dens are usually located in areas with loose-textured, friable soils (Morrell 1972; O'Farrell 1983). However, the depth and complexity of their dens suggest that they possess good digging abilities, and kit fox dens have been observed on a variety of soil types (U.S. Fish and Wildlife Service 1998). Some studies have suggested that where hardpan layers predominate, kit foxes create their dens by enlarging the burrows of California ground squirrels (*Spermophilus beecheyi*) or badgers (*Taxidea taxus*)(Jensen 1972; Morrell 1972; Orloff *et al.* 1986). In parts of their range, particularly in the foothills, kit foxes often use ground squirrel burrows for dens (Orloff *et al.* 1986). Kit fox dens are commonly located on flat terrain or on the lower slopes of hills. About 77 percent of all kit fox dens are at or below midslope (O'Farrell 1983), with the average slope at den sites ranging from 0 to 22 degrees (California Department of Fish and Game 1980; O'Farrell 1983; Orloff *et al.* 986). Natal and pupping dens are generally found in flatter terrain. Common locations for dens include washes, drainages, and roadside berms. Kit foxes also commonly den in human-made structures such as culverts and pipes (O'Farrell 1983; Spiegel *et al.* 1996a).

Natal and pupping dens of the San Joaquin kit fox may include from two to 18 entrances and are usually larger than dens that are not used for reproduction (O'Farrell *et al.* 1980; O'Farrell and McCue 1981). Natal dens may be reused in subsequent years (Egoscue 1962). It has been speculated that natal dens are located in the same location as ancestral breeding sites (O'Farrell 1983). Active natal dens are generally 1.2 to 2 miles from the dens of other mated kit fox pairs (Egoscue 1962; O'Farrell and Gilbertson 1979). Natal and pupping dens usually can be identified by the presence of scat, prey remains, matted vegetation, and mounds of excavated soil (i.e. ramps) outside the dens (O'Farrell 1983). However, some active dens in areas outside the valley floor often do not show evidence of use (Orloff *et al.* 1986). During telemetry studies of kit foxes in the northern portion of their range, 70 percent of the dens that were known to be active showed no sign of use (e.g., tracks, scats, ramps, or prey remains)(Orloff *et al.* 1986). In

another more recent study in the Coast Range, 79 percent of active kit fox dens lacked evidence of recent use other than signs of recent excavation (Jones and Stokes Associates 1997).

A San Joaquin kit fox can use more than 100 dens throughout its home range, although on average, an animal will use approximately 12 dens a year for shelter and escape cover (Cypher *et al.* 2001). Kit foxes typically use individual dens for only brief periods, often for only one day before moving to another den (Ralls *et al.* 1990). Possible reasons for changing dens include infestation by ectoparasites, local depletion of prey, or avoidance of coyotes (*Canis latrans*). Kit foxes tend to use dens that are located in the same general area, and clusters of dens can be surrounded by hundreds of hectares of similar habitat devoid of other dens (Egoscue 1962). In the southern San Joaquin Valley, kit foxes were found to use up to 39 dens within a denning range of 320 to 482 acres (Morrell 1972). An average den density of one den per 69 to 92 acres was reported by O'Farrell (1984) in the southern San Joaquin Valley.

Dens are used by San Joaquin kit foxes for temperature regulation, shelter from adverse environmental conditions, and escape from predators. Kit foxes excavate their own dens, use those constructed by other animals, and use human-made structures (culverts, abandoned pipelines, and banks in sumps or roadbeds). Kit foxes often change dens and may use many dens throughout the year; however, evidence that a den is being used by kit foxes may be absent. San Joaquin kit foxes have multiple dens within their home range and individual animals have been reported to use up to 70 different dens (Hall 1983). At the Naval Petroleum Reserve, individual kit foxes used an average of 11.8 dens per year (Koopman *et al.* 1998). Den switching by the San Joaquin kit fox may be a function of predator avoidance, local food availability, or external parasite infestations (e.g., fleas) in dens (Egoscue 1956).

The diet of the San Joaquin kit fox varies geographically, seasonally, and annually, based on temporal and spatial variation in abundance of potential prey. Known prey species of the kit fox include white-footed mice (*Peromyscus* spp.), insects, California ground squirrels, kangaroo rats (*Dipodomys* spp.), San Joaquin antelope squirrels (*Ammospermophilus nelsoni*), black-tailed hares (*Lepus californicus*), and chukar (*Alectoris chukar*) (Jensen 1972; Archon 1992). Kit foxes also prey on desert cottontails (*Sylvilagus audubonii)*, ground-nesting birds, and pocket mice (*Perognathus* spp.).

The diets and habitats selected by coyotes and San Joaquin kit foxes living in the same areas are often quite similar. Hence, the potential for resource competition between these species may be quite high when prey resources are scarce such as during droughts, which are quite common in semi-arid, central California. Competition for resources between coyotes and kit foxes may result in kit fox mortalities. Coyote-related injuries accounted for 50-87 per cent of the mortalities of radio collared kit foxes at Camp Roberts, the Carrizo Plain Natural Area, the Lokern Natural Area, and the Naval Petroleum Reserve (Cypher and Scrivner 1992; Standley *et al.* 1992).

San Joaquin kit foxes are primarily nocturnal, although individuals are occasionally observed resting or playing (mostly pups) near their dens during the day (Grinnell *et al.* 1937). Kit foxes

occupy home ranges that vary in size from 1.7 to 4.5 square miles (White and Ralls 1993). A mated pair of kit foxes and their current litter of pups usually occupy each home range (White and Ralls 1993, Spiegel 1996; White and Garrott 1997). Other adults, usually offspring from previous litters, also may be present (Koopman *et al.* 2000), but individuals often move independently within their home range (Cypher 2000). Ralls *et al.*(2001) found that foxes sometimes share dens with foxes from other groups; many of these cases involved unpaired individuals and appeared to be unsuccessful attempts at pair formation. Average distances traveled each night range from 5.8 to 9.1 miles and are greatest during the breeding season (Cypher 2000).

Kit foxes maintain core home range areas that are exclusive to mated pairs and their offspring This territorial spacing behavior eventually limits the number of foxes that can inhabit an area owing to shortages of available space and per capita prey. Hence, as habitat is fragmented or destroyed, the carrying capacity of an area is reduced and a larger proportion of the population is forced to disperse. Increased dispersal generally leads to lower survival rates and, in turn, decreased abundance because greater than 65 percent of dispersing juvenile foxes die within 10 days of leaving their natal range (Koopman *et al.* 2000).

Estimates of fox density vary greatly throughout its range, and have been reported as high as 3.11 per square mile in optimal habitats in good years (U.S. Fish and Wildlife Service 1998). At the Elk Hills in Kern County, density estimates varied from 0.7 animals per square kilometer (1.86 animals per square mile) in the early 1980s to 0.01 animals per square kilometer (0.03 animals per square mile) in 1991 (U.S. Fish and Wildlife Service 1998). Kit fox home ranges vary in size from approximately 1 to 12 square miles (Spiegel *et al.* 1996b; U.S. Fish and Wildlife Service 1998). Knapp (1978) estimated that a home range in agricultural areas is approximately 1 square mile. Individual home ranges overlap considerably, at least outside the core activity areas (Morrell 1972; Spiegel *et al.* 1996b).

Mean annual survival rates reported for adult San Joaquin kit foxes include 0.44 at the Naval Petroleum Reserve (Cypher *et al.* 2000), 0.53 at Camp Roberts (Standley *et al.* 1992), 0.56 at the Lokern area (Spiegel and Disney 1996), and 0.60 on the Carrizo Plain (Ralls and White 1995). However, survival rates widely vary among years (Spiegel and Disney 1996; Cypher *et al.* 2000). Mean survival rates for juvenile San Joaquin kit foxes (<1 year old) are lower than rates for adults. Survival to age 1 year was 0.14 at the Naval Petroleum Reserve (Cypher *et al.* 2000), 0.20 at Camp Roberts (Standley *et al.* 1992), and 0.21 on the Carrizo Plain (Ralls and White 1995). For both adults and juveniles, survival rates of males and females are similar. San Joaquin kit foxes may live to ten years in captivity (McGrew 1979) and 8 years in the wild (Berry *et al.* 1987), but most kit foxes do not live past 2-3 years of age.

The status (i.e., distribution, abundance) of the kit fox has decreased since its listing in 1967. This trend is reasonably certain to continue into the foreseeable future unless measures to protect, sustain, and restore suitable habitats, and alleviate other threats to their survival and recovery, are implemented. Threats that are seriously affecting kit foxes are described in further detail in the following sections.

Loss of Habitat

Less than 20 percent of the habitat within the historical range of the kit fox remained when the animal was listed as federally-endangered in 1967, and there has been a substantial net loss of habitat since that time. Historically, San Joaquin kit foxes occurred throughout California's Central Valley and adjacent foothills. Extensive land conversions in the Central Valley began as early as the mid-1800s with the Arkansas Reclamation Act. By the 1930's, the range of the kit fox had been reduced to the southern and western parts of the San Joaquin Valley (Grinnell *et al.* 1937). The primary factor contributing to this restricted distribution was the conversion of native habitat to irrigated cropland, industrial uses (e.g., hydrocarbon extraction), and urbanization (Laughrin 1970; Jensen 1972; Morrell 1972, 1975). Approximately one-half of the natural communities in the San Joaquin Valley were tilled or developed by 1958 (U.S. Fish and Wildlife Service 1980).

This rate of loss accelerated following the completion of the Central Valley Project and the State Water Project, which diverted and imported new water supplies for irrigated agriculture (U.S. Fish and Wildlife Service 1995a). Approximately 1.97 million acres of habitat, or about 66,000 acres per year, were converted in the San Joaquin region between 1950 and 1980 (California Department of Forestry and Fire Protection 1988). The counties specifically noted as having the highest wildland conversion rates included Kern, Tulare, Kings and Fresno, all of which are occupied by kit foxes. From 1959 to 1969 alone, an estimated 34 percent of natural lands were lost within the then-known kit fox range (Laughrin 1970).

By 1979, only approximately 370,000 acres out of a total of approximately 8.5 million acres on the San Joaquin Valley floor remained as non-developed land (Williams 1985; U.S. Fish and Wildlife Service 1980). Data from the California Department of Fish and Game (1985) and Service file information indicate that between 1977 and 1988, essential habitat for the blunt-nosed leopard lizard, a species that occupies habitat that is also suitable for kit foxes, declined by about 80 percent – from 311,680 acres to 63,060 acres, an average of about 22,000 acres per year (Biological Opinion for the Interim Water Contract Renewal, Service file 1-1-00-F-0056, February 29, 2000). Virtually all of the documented loss of essential habitat was the result of conversion to irrigated agriculture.

During 1990 to 1996, a gross total of approximately 71,500 acres of habitat were converted to farmland in 30 counties (total area 23.1 million acres) within the Conservation Program Focus area of the Central Valley Project. This figure includes 42,520 acres of grazing land and 28,854 acres of "other" land, which is predominantly comprised of native habitat. During this same time period, approximately 101,700 acres were converted to urban land use within the Conservation Program Focus area (California Department of Conservation 1994, 1996, 1998). This figure includes 49,705 acres of farmland, 20,476 acres of grazing land, and 31,366 acres of "other" land, which is predominantly comprised of native habitat. Because these assessments included a substantial portion of the Central Valley and adjacent foothills, they provide the best scientific and commercial information currently available regarding the patterns and trends of land conversion within the kit fox's geographic range. More than one million acres of suitable

habitat for kit foxes have been converted to agricultural, municipal, or industrial uses since the listing of the kit fox. In contrast, less than 500,000 acres have been preserved or are subject to community-level conservation efforts designed, at least in part, to further the conservation of the kit fox (U.S. Fish and Wildlife Service 1998).

Land conversions contribute to declines in kit fox abundance through direct and indirect mortalities, displacement, reduction of prey populations and denning sites, changes in the distribution and abundance of larger canids that compete with kit foxes for resources, and reductions in carrying capacity. Kit foxes may be buried in their dens during land conversion activities (C. Van Horn, Endangered Species Recovery Program, Bakersfield, personal communication to S. Jones, Fish and Wildlife Service, Sacramento, 2000), or permanently displaced from areas where structures are erected or the land is intensively irrigated (Jensen 1972; Morrell 1975). Furthermore, even moderate fragmentation or loss of habitat may significantly impact the abundance and distribution of kit foxes. Capture rates of kit foxes at the Naval Petroleum Reserve in Elk Hills were negatively associated with the extent of oil-field development after 1987 (Warrick and Cypher 1998). Likewise, the California Energy Commission found that the relative abundance of kit foxes was lower in oil-developed habitat than in nearby undeveloped habitat on the Lokern (Spiegel 1996). Researchers from both studies inferred that the most significant effect of oil development was the lowered carrying capacity for populations of both foxes and their prey species owing to the changes in habitat characteristics or the loss and fragmentation of habitat (Spiegel 1996; Warrick and Cypher 1998).

Dens are essential for the survival and reproduction of kit foxes that use them year-round for shelter and escape, and in the spring for rearing young. Hence, kit foxes generally have dozens of dens scattered throughout their territories. However, land conversion reduces the number of typical earthen dens available to kit foxes. For example, the average density of typical, earthen kit fox dens at the Naval Hills Petroleum Reserve was negatively correlated with the intensity of petroleum development (Zoellick *et al.* 1987), and almost 20 percent of the dens in developed areas were found to be in well casings, culverts, abandoned pipelines, oil well cellars, or in the banks of sumps or roads (U.S. Fish and Wildlife Service 1983). These results are important because the California Energy Commission found that, even though kit foxes frequently used pipes and culverts as dens in oil-developed areas of western Kern County, only earthen dens were used to birth and wean pups (Spiegel 1996). Similarly, kit foxes in Bakersfield use atypical dens, but have only been found to rear pups in earthen dens (Paul Kelly, Endangered Species Recovery Program, Fresno, California, personal communication to P. White, U.S. Fish and Wildlife Service, Sacramento, California April 6, 2000). Hence, the fragmentation of habitat and destruction of earthen dens could adversely affect the reproductive success of kit foxes. Furthermore, the destruction of earthen dens may also affect kit fox survival by reducing the number and distribution of escape refuges from predators.

Land conversions and associated human activities can lead to widespread changes in the availability and composition of mammalian prey for kit foxes. For example, oil field disturbances in western Kern County have resulted in shifts in the small mammal community from the primarily granivorous species that are the staple prey of kit foxes (Spiegel 1996), to

species adapted to early successional stages and disturbed areas (e.g., California ground squirrels)(Spiegel 1996). Because more than 70 percent of the diets of kit foxes usually consist of abundant rabbits (*Lepus*, *Sylvilagus*) and rodents (e. g., *Dipodomys* spp.), and kit foxes often continue to feed on their staple prey during ephemeral periods of prey scarcity, such changes in the availability and selection of foraging sites by kit foxes could influence their reproductive rates, which are strongly influenced by food supply and decrease during periods of prey scarcity (White and Garrott 1997, 1999).

Extensive habitat destruction and fragmentation have contributed to smaller, more-isolated populations of kit foxes. Small populations have a higher probability of extinction than larger populations because their low abundance renders them susceptible to stochastic (i.e., random) events such as high variability in age and sex ratios, and catastrophes such as floods, droughts, or disease epidemics (Lande 1988; Frankham and Ralls 1998; Saccheri *et al.* 1998). Similarly, isolated populations are more susceptible to extirpation by accidental or natural catastrophes because their recolonization has been hampered. These chance events can adversely affect small, isolated populations with devastating results. Extirpation can even occur when the members of a small population are healthy, because whether the population increases or decreases in size is less dependent on the age-specific probabilities of survival and reproduction than on raw chance (sampling probabilities). Owing to the probabilistic nature of extinction, many small populations will eventually lose out and go extinct when faced with these stochastic risks (Caughley and Gunn 1995).

Oil fields in the southern half of the San Joaquin Valley also continue to be an area of expansion and development activity. This expansion is reasonably certain to increase in the near future owing to market-driven increases in the price of oil. The cumulative and long-term effects of oil extraction activities on kit fox populations are not fully known, but recent studies indicate that moderate- to high-density oil fields may contribute to a decrease in carrying capacity for kit foxes owing to habitat loss or changes in habitat characteristics (Spiegel 1996; Warrick and Cypher 1998). There are no limiting factors or regulations that are likely to retard the development of additional oil fields. Hence, it is reasonably certain that development will continue to destroy and fragment kit fox habitat into the foreseeable future.

Competitive Interactions with Other Canids

Several species prey upon San Joaquin kit foxes. Predators (such as coyotes, bobcats, non-native red foxes, badgers, and golden eagles (*Aquila chrysaetos*) will kill kit foxes. Badgers, coyotes, and red foxes also may compete for den sites (U.S. Fish and Wildlife Service 1998). The diets and habitats selected by coyotes and kit foxes living in the same areas are often quite similar (Cypher and Spencer 1998). Hence, the potential for resource competition between these species may be quite high when prey resources are scarce such as during droughts, which are quite common in semi-arid, central California. Land conversions and associated human activities have led to changes in the distribution and abundance of coyotes, which compete with kit foxes for resources.

Coyotes occur in most areas with abundant populations of kit foxes and, during the past few decades, coyote abundance has increased in many areas owing to a decrease in ranching operations, favorable landscape changes, and reduced control efforts (Orloff *et al.* 1986; Cypher and Scrivner 1992; White and Ralls 1993; White *et al.* 1995). Coyotes may attempt to lessen resource competition with kit foxes by killing them. Coyote-related injuries accounted for 50-87 percent of the mortalities of radio collared kit foxes at Camp Roberts, the Carrizo Plain Natural Area, the Lokern Natural Area, and the Naval Petroleum Reserves (Cypher and Scrivner 1992; Standley *et al.* 1992; Ralls and White 1995; Spiegel 1996). Coyote-related deaths of adult foxes appear to be largely additive (i.e., in addition to deaths caused by other mortality factors such as disease and starvation) rather than compensatory (i.e., tending to replace deaths due to other mortality factors; White and Garrott 1997). Hence, the survival rates of adult foxes decrease significantly as the proportion of mortalities caused by coyotes increase (Cypher and Spencer 1998; White and Garrott 1997), and increases in coyote abundance may contribute to significant declines in kit fox abundance (Cypher and Scrivner 1992; Ralls and White 1995; White *et al.* 1996). There is some evidence that the proportion of juvenile foxes killed by coyotes increases as fox density increases (White and Garrott 1999). This density-dependent relationship would provide a feedback mechanism that reduces the amplitude of kit fox population dynamics and keeps foxes at lower densities than they might otherwise attain. In other words, coyote-related mortalities may dampen or prevent fox population growth, and accentuate, hasten, or prolong population declines.

Land-use changes also contributed to the expansion of non-native red foxes into areas inhabited by the San Joaquin kit fox. Historically, the geographic range of the red fox did not overlap with that of the kit fox. By the 1970's, however, introduced and escaped red foxes had established breeding populations in many areas inhabited by San Joaquin kit foxes (Lewis *et al.* 1993). The larger and more aggressive red foxes are known to kill kit foxes (Ralls and White 1995), and could displace them, as has been observed in the arctic when red foxes expanded into the ranges of smaller arctic foxes (Hersteinsson and Macdonald 1982). The increased abundance and distribution of nonnative red foxes will also likely adversely affect the status of kit foxes because they are closer morphologically and taxonomically, and would likely have higher dietary overlap than coyotes; potentially resulting in more intense competition for resources. Two documented deaths of kit foxes due to red foxes have been reported (Ralls and White 1995), and red foxes appear to be displacing kit foxes in the northwestern part of their range (Lewis *et al.* 1993). At Camp Roberts, red foxes have usurped several dens that were used by kit foxes during previous years (California Army National Guard, Camp Roberts Environmental Office, unpubl. data). In fact, opportunistic observations of red foxes in the cantonment area of Camp Roberts have increased 5-fold since 1993, and no kit foxes have been sighted or captured in this area since October 1997. Also, a telemetry study of sympatric red foxes and kit foxes in the Lost Hills area has detected spatial segregation between these species, suggesting that kit foxes may avoid or be excluded from red fox-inhabited areas (Paul Kelly, pers. comm. to P.J. White, April 6, 2000). Such avoidance would limit the resources available to local populations of kit foxes and possibly result in decreased fox abundance and distribution.

Disease

Wildlife diseases do not appear to be a primary mortality factor that consistently limits kit fox populations throughout their range (McCue and O'Farrell 1988; Standley and McCue 1992). However, central California has a high incidence of wildlife rabies cases (Schultz and Barrett 1991), and high seroprevalences of canine distemper virus and canine parvovirus indicate that kit fox populations have been exposed to these diseases (McCue and O'Farrell 1988; Standley and McCue 1992). Hence, disease outbreaks could potentially cause substantial mortality or contribute to reduced fertility in seropositive females, as was noted in the closely-related swift fox (*Vulpes velox*).

For example, there are some indications that rabies virus may have contributed to a catastrophic decrease in kit fox abundance at Camp Roberts, San Luis Obispo County, California, during the early 1990's. San Luis Obispo County had the highest incidence of wildlife rabies cases in California during 1989 to 1991, and striped skunks (*Mephitis mephitis*) were the primary vector (Barrett 1990; Schultz and Barrett 1991; Reilly and Mangiamele 1992). A rabid skunk was trapped at Camp Roberts during 1989 and two foxes were found dead due to rabies in 1990 (Standley *et al.* 1992). Captures of kit foxes during annual live trapping sessions at Camp Roberts decreased from 103 to 20 individuals during 1988 to 1991. Captures of kit foxes were positively correlated with captures of skunks during 1988 to 1997; suggesting that some factor(s) such as rabies virus was contributing to concurrent decreases in the abundances of these species. Also, captures of kit foxes at Camp Roberts were negatively correlated with the proportion of skunks that were rabid when trapped by County Public Health Department personnel two years previously. These data suggest that a rabies outbreak may have occurred in the skunk population and spread into the fox population. A similar time lag in disease transmission and subsequent population reductions was observed in Ontario, Canada, although in this instance the transmission was from red foxes to striped skunks (Macdonald and Voigt 1985).

Pesticides and Rodenticides

Pesticides and rodenticides pose a threat to kit foxes through direct or secondary poisoning. Kit foxes may be killed if they ingest rodenticide in a bait application, or if they eat a rodent that has consumed the bait. Even sublethal doses of rodenticides may lead to the death of these animals by impairing their ability to escape predators or find food. Pesticides and rodenticides may also indirectly affect the survival of kit foxes by reducing the abundances of their staple prey species.

For example, the California ground squirrel, which is the staple prey of kit foxes in the northern portion of their range, was thought to have been eliminated from Contra Costa County in 1975, after extensive rodent eradication programs. Field observations indicated that the long-term use of ground squirrel poisons in this county severely reduced kit fox abundance through secondary poisoning and the suppression of populations of its staple prey (Orloff *et al.* 1986).
Kit foxes occupying habitats adjacent to agricultural lands are also likely to come into contact with insecticides applied to crops owing to runoff or aerial drift. Kit foxes could be affected

through direct contact with sprays and treated soils, or through consumption of contaminated prey. Data from the California Department of Pesticide Regulation indicate that acephate, aldicarb, azinphos methyl, bendiocarb, carbofuran, chlorpyrifos, endosulfan, s-fenvalerate, naled, parathion, permethrin, phorate, and trifluralin are used within one mile of kit fox habitat. A wide variety of crops (alfalfa, almonds, apples, apricots, asparagus, avocados, barley, beans, beets, bok choy, broccoli, cantaloupe, carrots, cauliflower, celery, cherries, chestnuts, chicory, Chinese cabbage, Chinese greens, Chinese radish, collards, corn, cotton, cucumbers, eggplants, endive, figs, garlic, grapefruit, grapes, hay, kale, kiwi fruit, kohlrabi, leeks, lemons, lettuce, melons, mustard, nectarines, oats, okra, olives, onions, oranges, parsley, parsnips, peaches, peanuts, pears, peas, pecans, peppers, persimmons, pimentos, pistachios, plums, pomegranates, potatoes, prunes, pumpkins, quinces, radishes, raspberries, rice, safflower, sorghum, spinach, squash, strawberries, sugar beets, sweet potatoes, Swiss chard, tomatoes, walnuts, watermelons, and wheat), as well as buildings, Christmas tree plantations, commercial/industrial areas, greenhouses, nurseries, landscape maintenance, ornamental turf, rangeland, rights of way, and uncultivated agricultural and non-agricultural land, occur in close proximity to San Joaquin kit fox habitat.

Efforts have been underway to reduce the risk of rodenticides to kit foxes (U.S. Fish and Wildlife Service 1993). The Federal government began controlling the use of rodenticides in 1972 with a ban of Compound 1080 on Federal lands pursuant to Executive Order. Above-ground application of strychnine within the geographic ranges of listed species was prohibited in 1988. A July 28, 1992, biological opinion regarding the Animal Damage Control (now known as Wildlife Services) Program by the U.S. Department of Agriculture found that this program was likely to jeopardize the continued existence of the kit fox owing to the potential for rodent control activities to take the fox. As a result, several reasonable and prudent measures were implemented, including a ban on the use of M-44 devices, toxicants, and fumigants within the recognized occupied range of the kit fox. Also, the only chemical authorized for use by Wildlife Services within the occupied range of the kit fox was zinc phosphide, a compound known to be minimally toxic to kit foxes (U.S. Fish and Wildlife Service 1993).

Despite these efforts, the use of other pesticides and rodenticides still pose a significant threat to the kit fox, as evidenced by the death of 2 kit foxes at Camp Roberts in 1992 owing to secondary poisoning from chlorophacinone applied as a rodenticide, (Berry *et al.* 1992; Standley *et al.* 1992). Also, the livers of 3 kit foxes that were recovered in the City of Bakersfield during 1999 were found to contain detectable residues of the anticoagulant rodenticides chlorophacinone, brodifacoum, and bromadiolone (California Department of Fish and Game 1999).

To date, no specific research has been conducted on the effects of different pesticide or rodent control programs on the kit fox (U.S. Fish and Wildlife Service 1998). This lack of information is problematic because Williams (in litt., 1989) documented widespread pesticide use in known kit fox and Fresno kangaroo rat habitat adjoining agricultural lands in Madera County. In a separate report, Williams (in litt., 1989) documented another case of pesticide use near Raisin City in Fresno County, where treated grain was placed within an active Fresno kangaroo rat precinct. Also, farmers have been allowed to place bait on Bureau of Reclamation property to

maximize the potential for killing rodents before they entered adjoining fields (Biological Opinion for the Interim Water Contract Renewal, Service file 1-1-00-F-0056, February 29, 2000).

A September 22, 1993, biological opinion issued by the U.S. Fish and Wildlife Service to the Environmental Protection Agency (EPA) regarding the regulation of pesticide use (31 registered chemicals) through administration of the Federal Insecticide, Fungicide, and Rodenticide Act found that use of the following chemicals would likely jeopardize the continued existence of the kit fox: (1) aluminum and magnesium phosphide fumigants; (2) chlorophacinone anticoagulants; (3) diphacinone anticoagulants; (4) pival anticoagulants; (5) potassium nitrate and sodium nitrate gas cartridges; and (6) sodium cyanide capsules (U.S. Fish and Wildlife Service 1993). Reasonable and prudent alternatives to avoid jeopardy included restricting the use of aluminum/magnesium phosphide, potassium/sodium nitrate within the geographic range of the kit fox to qualified individuals, and prohibiting the use of chlorophacinone, diphacinone, pival, and sodium cyanide within the geographic range of the kit fox, with certain exceptions (e.g., agricultural areas that are greater than 1 mile from any kit fox habitat)(U.S. Fish and Wildlife Service 1999).

Endangered Species Act Section 9 Violations and Noncompliance with the Terms and Conditions of Existing Biological Opinions

The intentional or unintentional destruction of habitat occupied by the San Joaquin kit fox is an issue of serious concern. Section 9 of the Act prohibits the "take" (e.g., harm, harass, pursue, injure, kill) of federally-listed wildlife species. "Harm" is further defined to include habitat modification or degradation that kills or injures wildlife by impairing essential behavioral patterns including breeding, feeding, or sheltering. Congress established two provisions (under sections 7 and 10 of the Act) that allow for the incidental take of listed species of wildlife by Federal agencies, non-Federal government agencies, and private parties. Incidental take is defined as take that is "...incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." If no permit is obtained for the incidental take of listed species, the individuals or entities responsible for these actions could be liable under section 9 of the Act if any unauthorized take occurs. There are numerous examples of section 9 violations and noncompliance with the terms and conditions of existing biological opinions.

Risk of Chance Extinction Owing to Small Population Size, Isolation, and High Natural Fluctuations in Abundance

Historically, kit foxes may have existed in a metapopulation structure of core and satellite populations, some of which periodically experienced local extinctions and recolonization (U.S. Fish and Wildlife Service 1998). Today's populations exist in an environment drastically different from the historic one, however, and extensive habitat fragmentation will result in geographic isolation, smaller population sizes, and reduced genetic exchange among populations; all of which increase the vulnerability of kit fox populations to extirpation. Populations of kit foxes are extremely susceptible to the risks associated with small population

size and isolation because they are characterized by marked instability in population density. For example, the relative abundance of kit foxes at the Naval Petroleum Reserves, California, decreased 10-fold during 1981 to 1983, increased 7-fold during 1991 to 1994, and then decreased 2-fold during 1995 (Cypher and Scrivner 1992; Cypher and Spencer 1998).

Many populations of kit fox are at risk of chance extinction owing to small population size and isolation. This risk has been prominently illustrated during recent, drastic declines in the populations of kit foxes at Camp Roberts and Fort Hunter Liggett. Captures of kit foxes during annual live trapping sessions at Camp Roberts decreased from 103 to 20 individuals during 1988 to 1991. This decrease continued through 1997 when only three kit foxes were captured (White *et al.* 2000). A similar decrease in kit fox abundance occurred at nearby Fort Hunter Liggett, and only 2 kit foxes have been observed on this installation since 1995 (L. Clark, Wildlife Biologist, Fort Hunter Liggett, pers. comm. to P. J.White, February 15, 2000). It is unlikely that the current low abundances of kit foxes at Camp Roberts and Fort Hunter Liggett will increase substantially in the near future owing to the limited potential for recruitment. The chance of substantial immigration is low because the nearest core population on the Carrizo Plain is distant (greater than 16 miles) and separated from these installations by barriers to kit fox movement such as roads, developments, and irrigated agricultural areas. Also, there is a relatively high abundance of sympatric predators and competitors on these installations that contribute to low survival rates for kit foxes and, as a result, may limit population growth (White *et al.* 2000). Hence, these populations may be on the verge of extinction.

The destruction and fragmentation of habitat could also eventually lead to reduced genetic variation in populations of kit foxes that are small and geographically isolated. Historically, kit foxes likely existed in a metapopulation structure of core and satellite populations, some of which periodically experienced local extinctions and recolonization (U.S. Fish and Wildlife Service 1998). Preliminary genetic assessments indicate that historic gene flow among populations was quite high, with effective dispersal rates of at least one to 4 dispersers per generation (M. Schwartz, University of Montana, Missoula, Montana, pers. comm. to P.J. White , March 23, 2000). This level of genetic dispersal should allow for local adaptation while preventing the loss of any rare alleles. Based on these results, it is likely that northern populations of kit foxes were once panmictic (i.e., randomly mating in a genetic sense), or nearly so, with southern populations. In other words, there were no major barriers to dispersal among populations.

Current levels of gene flow also appear to be adequate, however, extensive habitat loss and fragmentation continues to form more or less geographically distinct populations of foxes, which could potentially reduce genetic exchange among them. An increase in inbreeding and the loss of genetic variation could increase the extinction risk for small, isolated populations of kit foxes by interacting with demography to reduce fecundity, juvenile survival, and lifespan (Lande 1988; Frankham and Ralls 1998; Saccheri *et al.* 1998).

An area of particular concern is Santa Nella in western Merced County where pending development plans threaten to eliminate the little suitable habitat that remains and provides a

dispersal corridor for kit foxes between the northern and southern portions of their range. Preliminary estimates of expected heterozygosity from foxes in this area indicate that this population already may have reduced genetic variation. Other populations that may be showing the initial signs of genetic isolation are the Lost Hills area and populations in the Salinas-Pajaro River watershed (i.e., Camp Roberts and Fort Hunter Liggett). Preliminary estimates of the mean number of alleles per locus from foxes in these populations indicate that allelic diversity is lower than expected. Although these results may, in part, be due to the small number of foxes sampled in these areas, they may also be indicative of an increase in the amount of inbreeding due to population subdivision (M. Schwartz, pers. Comm.. to P. J. White, March 23, 2000). Further sampling and analyses are necessary to adequately assess the effects of these potential genetic bottlenecks.

Arid systems are characterized by unpredictable fluctuations in precipitation, which lead to high frequency, high amplitude fluctuations in the abundance of mammalian prey for kit foxes (Goldingay *et al.* 1997; White and Garrott 1999). Because the reproductive and neonatal survival rates of kit foxes are strongly depressed at low prey densities (White and Ralls 1993; White and Garrott 1997, 1999), periods of prey scarcity owing to drought or excessive rain events can contribute to population crashes and marked instability in the abundance and distribution of kit foxes (White and Garrott 1999). In other words, unpredictable, short-term fluctuations in precipitation and, in turn, prey abundance can generate frequent, rapid decreases in kit fox density that increase the extinction risk for small, isolated populations.

The primary goal of the recovery strategy for kit foxes identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife 1998) is to establish a complex of interconnected core and satellite populations throughout the species' range. The long-term viability of each of these core and satellite populations depends partly upon periodic dispersal and genetic flow between them. Therefore, kit fox movement corridors between these populations must be preserved and maintained. In the northern range, from the Ciervo Panoche in Fresno County northward, kit fox populations are small and isolated, and have exhibited significant decline. The core populations are the Ciervo Panoche area, the Carrizo Plain area, and the western Kern County population. Satellite populations are found in the urban Bakersfield area, Porterville/Lake Success area, Creighton Ranch/Pixley Wildlife Refuge, Allensworth Ecological Reserve, Semitropic/Kern National Wildlife Refuge (NWR), Antelope Plain, eastern Kern grasslands, Pleasant Valley, western Madera County, Santa Nella, Kesterson NWR, and Contra Costa County. Major corridors connecting these population areas are on the east and west side of the San Joaquin Valley including the Millerton Lake area of Fresno Countyty, around the bottom of the Valley, and cross-valley corridors in Kern, Fresno, and Merced counties.

From 1991 to 2000, the Service authorized incidental take for thirteen projects in Alameda, Contra Costa, San Joaquin, and Stanislaus Counties that have resulted in the loss or degradation of approximately 2,644 acres of San Joaquin kit fox habitat (U.S. Fish and Wildlife Service 2001). Compensation measures for these projects protected or will protect 3,016 acres of kit fox habitat within this area. However, much of these conservation measures are in the form of

conservation easements, and for the most part, the lands are not actively managed for kit fox. The Service also recently issued an incidental permit for projects occurring in San Joaquin County as identified in the San Joaquin Multi-species Open Space and Conservation Plan. Since the issuance of this section 10(a)(1)(B) permit in July of 2001, three projects within the kit fox corridor have been or are in the process of being permitted. These projects will impact approximately 204 acres of kit fox habitat. The San Joaquin County Council of Governments will purchase lands at a ratio of 3:1 for natural lands and 1:1 for disturbed lands to mitigate for these impacts. In 2002, the McDonald Kit Fox Preserve was acquired in southwest San Joaquin County, to compensate for impacts of current and future actions that will affect the kit fox (San Joaquin County 2003).

Although there have been sightings of kit fox in the northern range through the years by qualified biologists, population studies in this area have been limited. In 1982 and 1983, a family of kit foxes was radio collared and monitored near Bethany Reservoir (Hall 1983). From 1985 to 1989, kit fox surveys in the Kellogg Creek watershed found a total of 114 potential and possibly active dens, most of which were associated with ground squirrel colonies (Jones & Stokes Associates 1989).

The small size of the population and its isolation from other established populations make this northern most population vulnerable to extinction owing to predation and competition from coyotes and red foxes, inbreeding, catastrophic events, and disease epidemics (White *et al.* 2000). Genetic studies conducted by Schwartz *et al.* (2000) found that individuals in the Los Banos population near San Luis Reservoir only breed with animals in the northern population in Alameda and Contra Costa counties. Thus, projects in Alameda and Contra Costa County that significantly reduce travel corridors and population size could potentially impact the Los Banos kit fox population. The long term viability of both populations depends, at least in part, on periodic immigration and gene flow from between the populations.

Habitat in the northern range is highly fragmented by highways, canals, and development. Interstate 580 runs southeast to northwest as it splits from Interstate 5, and turns west through the Altamont Pass area; thus it impedes both north-south and west-east movement of San Joaquin kit foxes. Although the canal system facilitates north-south migration along its length, it also impedes lateral east-west kit fox travel. Recent development proposals, including those described above, will further impede the movement of kit fox and isolate the northern population from more southern populations. These and other developments are slowly diminishing the last remaining kit fox habitat, and development pressures are expected to increase in the future (see *Cumulative Effects* section of this biological opinion). The protection of the remaining travel corridor, including grasslands west of Interstate 580, and lands between the California aqueduct and the Delta Mendota Canal, is vital to the survival of this population.

Suitable kit fox habitat in the form of grasslands is abundant in the action area, and contiguous within a 10-mile radius of the project (California Department of Transportation 2002). There is an abundance of grassland habitat and ground squirrels, which provide dens and a prey base (Nagano pers. obs. November 2004; California Department of Transportation 2004). According

to the California Department of Transportation (2004), signs of smaller rodents were also noted at the entrances of dens; they also reported other prey species of the San Joaquin kit fox in the form of the western fence lizards (*Sceloporus occidentalis*), black-tailed jack rabbits, and snakes. Several squirrel dens appeared to be enlarged by another animal (California Department of Transportation 2004). The San Joaquin kit fox has been documented to enlarge and utilize ground squirrel burrows. In addition, individuals of this species have been recorded to move as far as 9 miles or more in a single night (U.S. Fish and Wildlife Service 1998). The closest kit fox sighting to the proposed project is approximately 5 miles from the project site. There are no obvious natural barriers that would prevent kit fox movement within a 10-mile radius. Therefore, the Service believes that the San Joaquin kit fox is reasonably certain to occur within the action area because of the biology and ecology of the animal, the presence of suitable habitat in and adjacent to the project, as well as the nearby observations of this listed species.

California Tiger Salamander

The final rule listing the California tiger salamander as a threatened species was published on August 4, 2004 (U.S. Fish and Wildlife 2004).

The California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Adults may reach a total length of 8.2 inches Petranka 1998; Stebbins 2003). California tiger salamanders exhibit sexual dimorphism; males tend to be larger than females. The coloration of the California tiger salamander is white or yellowish markings against black. As adults, California tiger salamanders tend to have the creamy yellow to white spotting on the sides with much less on the dorsal surface of the animal, whereas other tiger salamander species have brighter yellow spotting that is heaviest on the top of the animals.

Historically, the California tiger salamander inhabited low elevation grassland and oak savanna plant communities of the Central Valley, and adjacent foothills, and the inner coast ranges in California (Jennings and Hayes 1994; Storer 1925; Shaffer *et al.* 1993). The species occurs from near sea level up to approximately 3900 feet in the coast ranges and up to about 1600 feet in the Sierra Nevada foothills (Shaffer *et al.* 2004). Along the coast ranges, the species occurred from the Santa Rosa area of Sonoma County south to the vicinity of Buellton in Santa Barbara County. In the Central Valley and surrounding foothills, the species occurred from northern Yolo County southward to northwestern Kern County and northern Tulare County.

The California tiger salamander has an obligate biphasic life cycle (Shaffer *et al.* 2004). Although the larvae salamanders develop in the vernal pools and ponds in which they were born, they are otherwise terrestrial salamanders that spend most of their postmetamorphic lives in widely dispersed underground retreats (Shaffer *et al.* 2004; Trenham *et al.* 2001). Subadult and adult California tiger salamanders spend the dry summer and fall months of the year in the burrows of small mammals, such as California ground squirrels and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and Van Vuren 1996; Petranka 1998; Trenham 1998a). Camel crickets and other invertebrates within these burrows likely are prey for California tiger salamanders, as well as protection from the sun and wind associated with the dry California climate that can cause dessication (drying out) of amphibian skin. Although California tiger

salamanders are members of a family known as "burrowing salamanders," California tiger salamanders are not known to create their own burrows in the wild, perhaps due to the hardness of soils in the California ecosystems in which they are found. Because they live underground in the burrows of mammals, they are rarely encountered by humans even where they are abundant. The burrows may be active or inactive, but because they collapse within approximately 18 months if not maintained, an active population of burrowing mammals is necessary to sustain

sufficient underground refugia for the species (Loredo *et al.* 1996). California tiger salamanders also may utilize leaf litter or dessication cracks in the soil.

The upland burrows inhabited by California tiger salamanders have often been referred to as "estivation" sites, which implies a state of inactivity, however, recent studies show that the animals move, feed, and remain active in their burrows (Trenham 2001; Van Hattem 2004). Researchers have long inferred that they are feeding while underground because the animals arrive at breeding ponds in good condition and are heavier when entering a pond than when leaving. Thus, upland habitat is a more accurate description of the terrestrial areas used by California tiger salamanders.

Once fall or winter rains begin, the salamanders emerge from the upland sites on rainy nights to feed and to migrate to the breeding ponds (Stebbins 1985, 1989; Shaffer *et al.* 1993). Adult salamanders mate in the breeding ponds, after which the females lay their eggs in the water (Twitty 1941; Shaffer *et al.* 1993; Petranka 1998). Historically, the California tiger salamander utilized vernal pools, but the animals also currently breed in livestock stockponds. Females attach their eggs singly, or in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris (Storer 1925; Twitty 1941). In ponds with no or limited vegetation, they may be attached to objects, such as rocks and boards on the bottom (Jennings and Hayes 1994). After breeding, adults leave the pool and return to the small mammal burrows (Loredo *et al.* 1996; Trenham 1998a), although they may continue to come out nightly for approximately the next two weeks to feed (Shaffer *et al.* 1993). In drought years, the seasonal pools may not fill and the adults can not breed (Barry and Shaffer 1994).

Salamander eggs hatch in ten to 14 days with newly hatched larvae salamanders ranging from 0.45 to 0.56 inch in total length (Petranka 1998). The larvae are aquatic. They are yellowish gray in color and have broad fat heads, possess large, feathery external gills, and broad dorsal fins that extend well onto their back. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks after hatching, after which they switch to larger prey (J. Anderson 1968). Larger larvae have been known to consume smaller tadpoles of Pacific treefrogs (*Pseudacris regilla*) and California red-legged frogs (*Rana aurora*) (J. Anderson 1968; P. Anderson 1968). The larvae are among the top aquatic predators in the seasonal pool ecosystems. They often rest on the bottom in shallow water, but also may be found at different layers in the water column in deeper water. The young salamanders are wary and when approached by potential predators, will dart into vegetation on the bottom of the pool (Storer 1925).

The larval stage of the California tiger salamander usually last three to six months, as most

seasonal ponds and pools dry up during the summer (Petranka 1998). Amphibian larvae must grow to a critical minimum body size before they can metamorphose (change into a different physical form) to the terrestrial stage (Wilbur and Collins 1973). Individuals collected near Stockton in the Central Valley during April varied from 1.88 to 2.32 inches in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left the breeding pools 60 to 94 days after the eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. The longer the ponding duration, the larger the larvae and metamorphosed juveniles are able to grow, and the more likely they are to survive and reproduce (Pechmann *et al.* 1989; Semlitsch et al. 1988; Morey 1998; Trenham 1998b). The larvae will perish if a site dries before metamorphosis is complete (P. Anderson 1968; Feaver 1971). Pechmann *et al.* (1988) found a strong positive correlation with ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 pools sampled supported larval California tiger salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only six (20 percent) provided suitable conditions for successful reproduction that year. Size at metamorphosis is positively correlated with stored body fat and survival of juvenile amphibians, and negatively correlated with age at first reproduction (Semlitsch *et al.* 1988; Scott 1994; Morey 1998). In the late spring or early summer, before the ponds dry completely, metamorphosed juveniles leave them and enter upland habitat. This emigration occurs in both wet and dry conditions (Loredo and Van Vuren 1996; Loredo *et al.* 1996). Unlike during their winter migration, the wet conditions that California tiger salamanders prefer do not generally occur during the months when their breeding ponds begin to dry. As a result, juveniles may be forced to leave their ponds on rainless nights. Under these conditions, they may move only short distances to find temporary upland sites for the dry summer months, waiting until the next winter's rains to move further into suitable upland refugia. Once juvenile California tiger salamanders leave their birth ponds for upland refugia, they typically do not return to ponds to breed for an average of 4 to 5 years.
However, they remain active in the uplands, coming to the surface during rainfall events to disperse or forage (Trenham and Shaffer, unpublished manuscript).

Lifetime reproductive success for California and other tiger salamanders is low. Trenham *et al.* (2000) found the average female bred 1.4 times and produced 8.5 young that survived to metamorphosis per reproductive effort. This resulted in roughly 11 metamorphic offspring over the lifetime of a female. Two reasons for the low reproductive success are the preliminary data suggest that most individuals of the California tiger salamanders require two years to become sexually mature, but some individuals may be slower to mature (Shaffer *et al.* 1993); and some animals do not breed until they are four to six years old. While individuals may survive for more than ten years, many breed only once, and in some populations, less than 5 percent of marked juveniles survive to become breeding adults (Trenham 1998b). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well as from human caused factors that reduce breeding success and individual survival. Factors that repeatedly lower breeding success in isolated pools can quickly extirpate a population.

Dispersal and migration movements made by California tiger salamanders can be grouped into two main categories: (1) breeding migration; and (2) interpond dispersal. Breeding migration is

the movement of salamanders to and from a pond from the surrounding upland habitat. After metamorphosis, juveniles move away from breeding ponds into the surrounding uplands, where they live continuously for several years. At a study in Monterey County, it was found that upon reaching sexual maturity, most individuals returned to their natal/ birth pond to breed, while 20 percent dispersed to other ponds (Trenham *et al.* 2001). Following breeding, adult California tiger salamanders return to upland habitats, where they may live for one or more years before breeding again (Trenham *et al.* 2000).

California tiger salamanders are known to travel large distances from breeding ponds into upland habitats. Maximum distances moved are generally difficult to establish for any species, but California tiger salamanders in Santa Barbara County have been recorded to disperse 1.3 miles from breeding ponds (Sweet 1998). California tiger salamanders are known to travel between breeding ponds; one study found that 20 to 25 percent of the individuals captured at one pond were recaptured later at ponds approximately 1,900 and 2,200 feet away (Trenham *et al.* 2001). In addition to traveling long distances during migration to or dispersal from ponds, California tiger salamanders may reside in burrows that are far from ponds. At one site in Contra Costa County, hundreds of California tiger salamanders have been captured three years in a row in upland habitat approximately 0.75 mile from the nearest breeding pond (Orloff 2003).

Although the observations above show that California tiger salamanders can travel far, typically they stay closer to breeding ponds. Evidence suggests that juvenile California tiger salamanders disperse further into upland habitats than adult California tiger salamanders. A trapping study conducted in Solano County during winter of 2002/2003 found that juveniles used upland habitats further from breeding ponds than adults (Trenham and Shaffer in press). More juvenile salamanders were captured at distances of 328, 656, and 1,312 feet from a breeding pond than at 164 feet. Large numbers, approximately 20 percent of total captures, were found 1,312 feet from a breeding pond. Fitting a distribution curve to the data revealed that 95 percent of juvenile salamanders could be found within 2,099 feet of the pond, with the remaining 5 percent being found at even greater distances. Preliminary results from the 2003-04 trapping efforts detected juvenile California tiger salamanders at even further distances, with a large proportion of the total salamanders caught at 2,297 feet from the breeding pond (Trenham *et al.*, unpublished data). Surprisingly, most juveniles captured, even those at 2100 feet, were still moving away from ponds (Ben Fitzpatrick, University of California at Davis, pers. comm. 2004). In Santa Barbara County, juvenile California tiger salamanders have been trapped approximately 1,200 feet away while dispersing from their natal pond (Science Applications International Corporation, unpublished data). These data show that many California tiger salamanders travel far while still in the juvenile stage. Post-breeding movements away from breeding ponds by adults appear to be much smaller. During post-breeding emigration, radio-equipped adult California tiger salamanders were tracked to burrows 62 to 813 feet from their breeding ponds (Trenham 2001). These reduced movements may be due to adult California tiger salamanders having depleted physical reserves post-breeding, or also due to the drier weather conditions that can occur during the period when adults leave the ponds.

In addition, rather than staying in a single burrow, most individuals used several successive burrows at increasing distances from the pond. Although the studies discussed above provide an

approximation of the distances that California tiger salamanders regularly move from their breeding ponds, upland habitat features will drive the details of movements in a particular landscape. Trenham (2001) found that radio-tracked adults favored grasslands with scattered large oaks, over more densely wooded areas. A drift-fence survey at a Santa Barbara County pond that is bordered by a strawberry field found that many emigrating juveniles moved towards the strawberry field; however, no adults were captured entering the pond from this direction. Most of the California tiger salamanders entered the pond from extensive, overgrazed grassy flats rather than sandhill or eucalyptus habitats in other quadrants (Steve Sykes, University of California at Santa Barbara, unpublished data 2003). Based on radio-tracked adults, there is no indication that certain habitat types are favored as corridors for terrestrial movements (Trenham 2001). In addition, at two ponds completely encircled by drift fences and pitfall traps, captures of arriving adults and dispersing new metamorphs were distributed roughly evenly around the ponds. Thus, it appears that dispersal into the terrestrial habitat occurs randomly with respect to direction and habitat types.

Several species prey have either been documented or likely prey upon the California tiger salamander including coyotes (*Canis latrans*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), egrets (*Egretta* species), great blue herons (*Ardea herodias*), crows (*Corvus brachyrhynchos*), ravens (*Corvus corax*), bullfrogs (*Rana catesbeiana*), mosquito fish (*Gambusia affinis*), and crayfish (*Procrambus* species). Domestic dogs (*Canis familiaris*) have been observed eating California tiger salamanders at Lake Lagunitas at Stanford University (Sean Barry, ENTRIX, pers. comm. to C. Nagano July 2004).

The California tiger salamander is imperiled throughout its range by a variety of human activities (U.S. Fish and Wildlife Service 2004). Current factors associated with declining populations of the salamander include continued degradation and loss of habitat due to agriculture and urbanization, hybridization with non-native eastern tiger salamanders (*Ambystoma tigrinum*)(Fitzpatrick and Shaffer 2004; Riley *et al.* 2003), and introduced predators. Fragmentation of existing habitat and the continued colonization of existing habitat by non-native tiger salamanders (*Ambystoma tigrinum* and other species) may represent the most significant current threats to California tiger salamanders, although populations are likely threatened by more than one factor. Isolation and fragmentation of habitats within many watersheds have precluded dispersal between sub-populations and jeopardized the viability of metapopulations (broadly defined as multiple subpopulations that occasionally exchange individuals through dispersal, and are capable of colonizing or "rescuing" extinct habitat patches). Other threats are predation and competition from introduced exotic species; possible commercial overutilization; disease; various chemical contaminants; road-crossing mortality; and certain unrestrictive mosquito and rodent control operations. The various primary and secondary threats are not currently being offset by existing Federal, State, or local regulatory mechanisms. The California tiger salamander also is vulnerable to chance environmental or demographic events, to which small populations are particularly vulnerable.

Thirty-one percent (221 of 711 records and occurrences) of all Central California tiger salamander records and occurrences are in Alameda, Santa Clara, San Benito (excluding the extreme western end of the County), southwestern San Joaquin, western Stanislaus, western

Merced, and southeastern San Mateo counties, most of them are in eastern Alameda and Santa Clara counties (Buckingham in litt. 2003; California Department of Fish and Game 2003; U.S. Fish and Wildlife Service 2004). Thirteen of these records in the Bay Area region are considered extirpated or likely to be extirpated by the California Department of Fish and Game (2003).

The East Bay and Livermore Valley areas have undergone intensive urban development in recent years (California Department of Conservation 1996, 1998, 2000, 2002). The total human population of the counties in the Bay Area Region increased by approximately 17 percent between 1990 and 2000 (4.5 million people to 5.3 million people) (California Department of Forestry 1998). Most of the California tiger salamander natural historic habitat (vernal pool grasslands) available in this region has been lost due to urbanization and conversion to intensive agriculture (Keeler-Wolf *et al.* 1998). California tiger salamanders are now primarily restricted to artificial breeding ponds, such as bermed ponds or stock ponds which are typically located at higher elevations (California Department of Fish and Game 2003).

Of 140 California tiger salamander localities where wetland type was identified, only 7 percent were located in vernal pools (California Department of Fish and Game 2003). The Bay Area region occurs within the Central Coast and Livermore vernal pool regions (Keeler-Wolf *et al.* 1998). Vernal pools within the Coast Range are more sporadically distributed than vernal pools in the Central Valley (Holland 2003). In San Benito and Santa Clara counties, Central Coast vernal pools have been destroyed and degraded due to agriculture. The vernal pools at Stanford in Santa Clara County have been destroyed and degraded due to recreation and development (Keeler-Wolf *et al.* 1998). The annual loss of vernal pools from 1994 to 2000 in Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura counties was 2 to 3 percent; this rate of loss suggests that vernal pools in these counties are disappearing faster than previously reported (Holland 2003). Most of the vernal pools in the Livermore Region in Alameda County have been destroyed or degraded by urban development, agriculture, water diversions, and poor water quality, and long-term overgrazing (Keeler-Wolf *et al.* 1998). During the 1980s and 1990s, vernal pools were lost at a 1.1 percent annual rate in Alameda County (Holland 1998).

Due to the extensive losses of vernal pool complexes and their limited distribution in the Bay Area region, many California tiger salamander breeding sites consist of artificial water bodies. Overall, 89 percent (124) of the records for which the water body was identified are in stock, farm, or berm ponds used by cattle grazing and as a temporary source of water for small farm irrigation (California Department of Fish and Game 2003), possibly placing California tiger salamanders at great risk of hybridization with non-native tiger salamanders especially in Santa Clara and San Benito counties. Without long-term maintenance the longevity of these artificial breeding habitats is also much shorter than their natural breeding habitat, which are vernal pools (Shaffer in litt. 2003).

Shaffer *et al.* (1993) found that the East Bay counties of Alameda and Contra Costa supported the greatest concentrations of California tiger salamander. California tiger salamander populations in the Livermore Valley are severely threatened by the ongoing conversion of grazing land to subdivisions and vineyards (Stebbins 1989; East Bay Regional Park District 1999). One project within Alameda County in the Bay Area region that may affect California

tiger salamander totals 700 acres (East Bay Regional Parks District 2003). Projects that are likely to threaten California tiger salamanders in the Bay Area region include one in Alameda County totaling 310 acres, two in San Joaquin County totaling 12,427 acres and one in Santa Clara County totaling 19 acres.

Larvae California tiger salamander were observed in the large pool designated as Site 1 in the fairy shrimp survey (URS 2003), and there are numerous recent sightings in this area recorded in the California Natural Diversity Data Base (California Department of Fish and Game 2004). Suitable salamander breeding habitat also exists in a 60-acre mitigation site for the California red-legged frog and the California tiger salamander at the east end of the project area and north of State Route 84. The site was established to mitigate for impacts resulting from of the Ruby Hills and Vineyard Estates subdivision. Juvenile salamanders were observed during fairy shrimp surveys in seasonal pools within the action area. Suitable California tiger salamander habitat in the form of grasslands is abundant in the action area (Nagano pers. obs. November 2004; California Department of Transportation 2002). There is an abundance of ground squirrels, whose burrows provide underground upland habitat for the amphibian (Nagano pers. obs. November 2004; California Department of Transportation 2004). Therefore, the Service has determined it is reasonable to conclude the California tiger salamander inhabits the action area, based on the biology and ecology of the species, the presence of suitable habitat, as well as the recent observations of this animal.

California Tiger Salamander Proposed Critical Habitat

Critical habitat for the California tiger salamander was proposed on August 10, 2004 (U.S. Fish and Wildlife Service 2004). The Service divided the current range of the Central population into four regions: (1) Central Valley; (2) Southern San Joaquin Valley; (3) East Bay; and (4) Central Coast. The project area is located in the East Bay region.

The Service determined that conserving the California tiger salamander over the long-term requires a five-pronged approach: (1) Maintaining the current genetic structure across the species range; (2) maintaining the current geographical, elevational, and ecological distribution; (3) protecting the hydrology and water quality of breeding pools and ponds; (4) retaining or providing for connectivity between locations for genetic exchange and recolonizaiton; (5) protecting sufficient barrier-free upland habitat around each breeding location to allow for sufficient survival and recruitment to maintain a breeding population over the long-term (U.S. Fish and Wildlife Service 2004).

The Service believes that areas proposed for critical habitat may require certain management considerations or protections due to the following threats: (1) Activities that introduce or promote the occurrence of bullfrogs and fish; (2) Activities that could disturb aquatic habitats during the breeding season; (3) Activities that impair the water quality of aquatic breeding habitats; (4) Activities that would reduce small mammal populations to the point that there is insufficient underground Central population refugia used for foraging, protection from predators, and shelter from the elements; (5) Activities that create barriers impassible for salamanders or road crossings that increase mortality in upland habitat between extant occurrences in breeding

habitat; (6) Activities on adjacent uplands that disrupt vernal pool complexes' ability to support California tiger salamander breeding function; (7) Activities that introduce non-native tiger salamanders in areas where the California tiger salamander is threatened with hybridization (U.S. Fish and Wildlife Service 2004).

In determining which areas to designate as critical habitat, the Service considers those physical and biological features (primary constituent elements) that are essential to the conservation of the species, and that may require special management considerations and protection (50 CFR § 424.14). The Service lists the known primary constituent elements together with the proposed critical habitat description. Such physical and biological features include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing (or development) of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

The primary constituent elements for the California tiger salamander are aquatic and upland areas, including vernal pool complexes, where suitable breeding and non-breeding habitats are interspersed throughout the landscape, and are interconnected by continuous dispersal habitat. All areas proposed as critical habitat for the central population contain one or more of the primary constituent elements (U.S. Fish and Wildlife Service 2004).

Breeding Habitat. Standing bodies of fresh water, including natural and man-made (*e.g.* stock) ponds, vernal pools, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a sufficient length of time necessary for the species to complete its life cycle (U.S. Fish and Wildlife Service 2004).

Breeding California tiger salamander are found in vernal pools, vernal pool complexes, and seasonal ponds in associated annual grasslands, oak savannah, and coastal bay scrub plant communities of the Bay Area (Santa Clara Valley), Central Coast, Central Valley, and Southern San Joaquin Valley. The California tiger salamander also have adapted to using artificial water bodies, such as stock ponds during their aquatic phase. However, stockponds are often not optimum breeding habitat because the hydroperiod is so short there is not sufficient time for larvae to metamorphose, or it is so long that predatory fish and bullfrogs can colonize the pond. Permanent wetlands can support breeding California tiger salamander if fish are not present, but extirpation of the salamander is likely to occur if fish are introduced. Periodic maintenance to remove silt from stockponds and other artificial waterbodies may also cause a temporary loss of functioning aquatic habitat. Regardless of vernal pool, pond, or seasonal wetland type, successful breeding ponds for California tiger salamander need to be inundated for a minimum of 21 weeks to allow for successful metamorphosis (U. S. Fish and Wildlife Service 2004).

Non-Breeding Habitat. California tiger salamanders spend the majority of their lives in barrier-free upland habitats adjacent to breeding ponds. Within these upland habitats, adult California tiger salamander spend part of their lives in the underground burrows of mammals, especially the burrows of the California ground squirrel and valley pocket gopher, with depths ranging from 20

centimeters to 1 meter beneath the ground surface. Small mammals are essential in creating the underground habitat that adult California tiger salamander depend on for food, shelter, and protection form the elements and form predation. Although California tiger salamander are members of a family of burrowing tiger salamanders, California tiger salamander are not known to create their own burrows in the wild and require small mammal burrows for survival. The upland component of the Central population habitat typically consists of vernal pool grassland or grassland savannah with scattered oak trees. However, some occupied California tiger salamander breeding ponds exist within mixed grassland and woodland habitats, in woodlands, scrub, or chaparral habitats (U.S. Fish and Wildlife Service 2004).

Dispersal and Migration. Movements made by California tiger salamander can be grouped into two main categories: (1) Breeding migration, and (2) interpond dispersal. Breeding migration is the movement of salamanders to and from a pond from the surrounding upland habitat. After metamorphosis, juveniles move away from breeding ponds into the surrounding uplands, where they live continuously for several years (on average, four years). Upon reaching sexual maturity, most individuals return to their natal (birth) pond to breed, while 20 percent disperse to other ponds (U. S. Fish and Wildlife Service 2004).

Essential dispersal habitats generally consist of upland areas adjacent to essential aquatic habitats which are not isolated from other essential aquatic habitats by barriers that California tiger salamander cannot cross. Essential dispersal habitats provide connectivity among California tiger salamander suitable aquatic and upland habitats. While California tiger salamander can bypass many obstacles, and do not require a particular type of habitat for dispersal, the habitats connecting essential aquatic and upland habitats need to be free of barriers (*e.g.* a physical or biological feature that prevents salamanders from dispersing beyond the feature) to function effectively (U. S. Fish and Wildlife Service 2004).

The Service proposed critical habitat that allowed for dispersal between extant occurrences within 0.7 mile of each other. This distance was selected because it provides for 99 percent of the chances that individual salamanders can move and breed between extant occurrences, and, thereby, provides for genetic exchange between individual within the region (U.S. Fish and Wildlife Service 2004).

The proposed Pigeon Pass Project is located in Unit 3 of critical habitat proposed by the Service (U.S. Fish and Wildlife Service 2004b). The project area is relatively undeveloped, with the highway corridor, the Ruby Hills and Vineyard Estates developments, and several ranches in the project vicinity. The surrounding habitat includes several vegetation communities, including valley oak woodland, annual non-native grassland, seasonally wetted areas with associated vegetation, and ponds. A 60-acre California red-legged frog/California tiger salamander mitigation site for the Ruby Hills/Vineyard Estates consists of a series of artificial ponds connected by drainages, and the surrounding upland habitat. As described in the Biological Assessment, essentially all undeveloped lands on and adjacent to the action area contain the constituent elements of proposed California tiger salamander critical habitat, including aquatic habitat, associated uplands, and dispersal habitat.

California Red-Legged Frog

The California red-legged frog was listed as a threatened species on May 23, 1996, (U.S. Fish and Wildlife Service 1996). Please refer to the final rule and the *Recovery Plan for the California Red-Legged Frog (Rana aurora draytonii)*(U.S. Fish and Wildlife Service 2002) for additional information on this species.

This species is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 1985). The abdomen and hind legs of adults are largely red; the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 1985), and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

California red-legged frogs have paired vocal sacs and vocalize in air (Hayes and Krempels 1986). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on the surface of the water (Hayes and Miyamoto 1984). California red-legged frogs breed from November through March with earlier breeding records occurring in southern localities (Storer 1925). Individuals occurring in coastal drainages are active year-round (Jennings et al. 1992), whereas those found in interior sites are normally less active during the cold season.

The historic range of the red-legged frog extended coastally from the vicinity of Point Reyes National Seashore, Marin County, California, and inland from the vicinity of Redding, Shasta County, California, southward to northwestern Baja California, Mexico (Jennings and Hayes 1985; Hayes and Krempels 1986). The California Red-legged frog was historically documented with 46 counties but the taxa now remains in 238 streams or drainages within 23 counties, representing a loss of 70 percent of its former range (U.S. Fish and Wildlife Service 2002). Red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the central coast. Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse Ranges. The species is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico (California Department of Fish and Game 2002).

California red-legged frogs have been extirpated or nearly extirpated from over 70 percent of their former range. Historically, this species was found throughout the Central Valley and Sierra Nevada foothills. As of 1996, California red-legged frogs have been documented in approximately 240 streams or drainages from 23 counties, primarily in central coastal California. Monterey, San Luis Obispo, and Santa Barbara counties support the largest extent of currently occupied habitat. The most secure aggregations of California red-legged frogs are found in aquatic sites that support substantial riparian and aquatic vegetation and lack non-native predators.

Adult California red-legged frogs prefer dense, shrubby or emergent riparian vegetation closely associated with deep (>2.3 feet), still, or slow-moving water (Hayes and Jennings 1988). However, frogs also have been found in ephemeral creeks and drainages and in ponds that may or may not have riparian vegetation. The largest densities of California red-legged frogs currently are associated with deep pools with dense stands of overhanging willows (*Salix* spp.) and an intermixed fringe of cattails (*Typha latifolia*) (Jennings 1988). California red-legged frogs disperse upstream and downstream of their breeding habitat to forage and seek sheltering habitat. Sheltering habitat for California red-legged frogs is potentially all aquatic, riparian, and upland areas within the range of the species and includes any landscape features that provide cover, such as existing animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay ricks may also be used. Incised stream channels with portions narrower than 46 centimerts (18 inches) and depths greater than 46 cm (18 in) may also provide important summer sheltering habitat. Accessability to sheltering habitat is essential for the survival of California red-legged frogs within a watershed, and can be a factor limiting frog population numbers and survival. During winter rain events, juvenile and adult California red-legged frogs are known to disperse up to 0.54-1.08 miles (Rathbun and Holland, unpublished data, cited in Rathbun *et al.* 1997). Dispersing frogs in northern Santa Cruz County traveled distances from 0.25 mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger, unpublished data).

Egg masses contain about 2,000 to 5,000 moderate sized (0.08 to 0.11 inches in diameter), dark reddish brown eggs and are typically attached to vertical emergent vegetation, such as bulrushes (*Scirpus* spp.) or cattails (Jennings *et al.* 1992). California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Eggs hatch in 6 to 14 days (Jennings 1988). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings *et al.* 1992); eggs exposed to salinity levels greater than 4.5 parts per thousand result in 100 percent mortality (Jennings and Hayes 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3.5 to 7 months after hatching (Storer 1925; Wright and Wright 1949; Jennings and Hayes 1990). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings *et al.* 1992). Sexual maturity normally is reached at 3 to 4 years of age (Storer 1925; Jennings and Hayes 1985). California red-legged frogs may live 8 to 10 years (Jennings *et al.* 1992). Populations of California red-legged frogs fluctuate from year to year. When conditions are favorable California red-legged frogs can experience extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, California red-legged frogs may temporarily disappear from an area when conditions are stressful (e.g., drought).

The diet of California red-legged frogs is highly variable. Hayes and Tennant (1985) found invertebrates to be the most common food items. Vertebrates, such as Pacific tree frogs (*Hyla regilla*) and California mice (*Peromyscus californicus*), represented over half the prey mass eaten by larger frogs (Hayes and Tennant 1985). Hayes and Tennant (1985) found juvenile frogs to be active diurnally and nocturnally, whereas adult frogs were largely nocturnal. Feeding

activity probably occurs along the shoreline and on the surface of the water (Hayes and Tennant 1985). Tadpoles likely eat algae (Jennings *et al.* 1992).
Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (*Rana catesbeiana*) (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish (*Procambarus clarkii*), signal crayfish (*Pacifastacus leniusculus*), and several species of warm water fish including sunfish (*Lepomis* spp.), goldfish (*Carassius auratus*), common carp (*Cyprinus carpio*), and mosquitofish (*Gambusia affinis*) (L. Hunt, in litt. 1993; S. Barry, in litt. 1992; S. Sweet, in litt. 1993). Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the California red-legged frog throughout its range.

Several researchers in central California have noted the decline and eventual disappearance of California red-legged frog populations once bullfrogs became established at the same site (L. Hunt, in litt. 1993; S. Barry, in litt. 1992; S. Sweet, in litt. 1993). This has been attributed to both predation and competition. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs (*Rana aurora aurora*), and suggested that bullfrogs could prey on subadult northern red-legged frogs as well. In addition to predation, bullfrogs may have a competitive advantage over California red-legged frogs; bullfrogs are larger, possess more generalized food habits (Bury and Whelan 1984), have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977), and larvae are unpalatable to predatory fish (Kruse and Francis 1977). In addition to competition, bullfrogs also interfere with California red-legged frog reproduction. Both California and northern red-legged frogs have been observed in amplexus with (mounted on) both male and female bullfrogs (Jennings and Hayes 1990; Twedt 1993; M. Jennings, in litt.1993; R. Stebbins in litt. 1993). Thus bullfrogs are able to prey upon and out-compete California red-legged frogs, especially in sub-optimal habitat. The urbanization of land within and adjacent to California red-legged frog habitat has also impacted California red-legged frogs. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks California red-legged frog dispersal, and the introduction of predatory fishes and bullfrogs. This report further identifies the conversion and isolation of perennial pool habitats resulting from urbanization as an ongoing impact to California red-legged frogs.

The recovery plan for the California red-legged frog identifies eight recovery units. Each recovery unit reflects areas with similar conservation needs. The strategy for recovery of California red-legged frogs includes promoting and protecting populations that are geographically distributed in a manner that allows for the continued existence of viable metapopulations. The California red-legged frog has been extirpated or nearly extirpated from over 70 percent of their former range. Historically, this species was found throughout the Central Valley and Sierra Nevada foothills. As of 1996, California red-legged frogs have been documented in approximately 240 streams or drainages from 23 counties, primarily in central coastal California. Monterey, San Luis Obispo, and Santa Barbara counties support the largest extent of currently occupied habitat. The most secure aggregations of California red-legged frogs are found in aquatic sites that support substantial riparian and aquatic vegetation and lack non-native predators.

This project is located within the East San Francisco Bay Recovery Unit, which extends from the northernmost portion of Contra Costa County, includes a portion of San Joaquin County south to Santa Clara County, includes the eastern portion of San Mateo County, and all of San Francisco County (U. S. Fish and Wildlife Service 2002). Contra Costa and Alameda counties contain the majority of known California red-legged frog localities within the eastern San Francisco Bay area. Within this recovery unit, the listed amphibian seem to have been nearly eliminated from the western lowland areas near urbanization, they still occur in isolated populations in the East Bay Foothills (between Interstate 580 and Interstate 680), and are abundant in several areas in the eastern portions of Alameda and Contra Costa counties. This recovery unit is essential to the survival and recovery of California red-legged frogs, as it contains the largest number of occupied drainages in the northern portion of its range. The eastern and western edges of this area are heavily urbanized and the northern and southern edges are bounded by major highways. However, there are numerous small drainages flowing underneath both Interstate 580 and Highway 84 that California red-legged frogs could disperse through. Therefore, this area is connected to other populations of red-legged frogs in the foothills of central Alameda and Contra Costa Counties and the populations found in eastern Alameda County. Within this area, the species historically bred in several ponds and drainages within the proposed project area, Garin/Dry Creek Regional Park, Pleasanton Ridge Regional Park, and Sinbad Creek.

There are several recent sightings of the California red-legged frog in the action area and throughout the region south of Livermore (California Department of Fish and Game 2004; California Department of Transportation 2004). Surveys for the vernal pool fairy shrimp conducted by California Department of Transportation in the Pigeon Pass Project action area detected California red-legged frog egg masses (California Department of Transportation 2004). Habitat of this listed species occurs along the entire Pigeon Pass Project corridor, and includes several drainage crossings. Adult California red-legged frogs are highly mobile and may move considerable distances from their breeding ponds. Areas containing aquatic and upland habitat exist within and adjacent to the action area (Nagano pers. obs. November 2004). The action area contains components that can be used by the California red-legged frog for feeding, resting, mating, movement corridors, and other essential behaviors. Therefore, the Service believes that the California red-legged frog is reasonably certain to occur within the action area because of the biology and ecology of the animal, the presence of suitable habitat in and adjacent to the action area, as well as the recent observations of this listed species.

California Red-Legged Frog Proposed Critical Habitat

On March 13, 2001, the final rule determining critical habitat for red-legged frogs was published in the Federal Register (U.S. Fish and Wildlife Service 2001). This rule established 31 critical habitat units based on three primary constituent elements: (a) essential aquatic habitat; (b) associated uplands; and (c) dispersal habitat connecting essential aquatic habitat. In November 2002, the U.S. District Court for the District of Columbia vacated most of the 2001 designation and ordered the Service to publish a new critical habitat proposal. On April 13, 2004, the Service re-proposed 4.1 million acres in 28 California counties as critical habitat for the frog (U.S. Fish and Wildlife Service 2004). This proposed rule basically re-proposes the same areas designated critical habitat in the 2001 final rule.

The Service is required to list the known primary constituent elements together with the critical habitat description. Such physical and biological features include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing (or development) of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species (U. S. Fish and Wildlife Service 2004).

Due to the complex life history and dispersal capabilities of the California red-legged frog, and the dynamic nature of the environments in which they are found, the primary constituent elements described below are found throughout the watersheds that are proposed as critical habitat. Special management, such as habitat rehabilitation efforts (e.g., removal of nonnative predators), may be necessary in the area designated. The proposed critical habitat for the California red-legged frog provides for breeding and non-breeding habitats and for dispersal between these habitats, as well as allowing for expansion of frog populations vital to the recovery of the subspecies. The proposed critical habitat includes: (a) essential aquatic habitat; (b) associated uplands; and (c) dispersal habitat connecting essential aquatic habitat.

Aquatic habitat is essential for providing space, food, and cover, necessary to sustain all life stages of red-legged frogs. It consists of virtually all low-gradient fresh water bodies, including natural and man-made (e.g., stock) ponds, backwaters within streams and creeks, marshes, lagoons, and dune ponds, except deep lacustrine water habitat (e.g., deep lakes and reservoirs 50 acres or larger in size) inhabited by nonnative predators. The subspecies requires a permanent water source to ensure that aquatic habitat is available year-round. Permanent water sources can include, but are not limited to, ponds, perennial creeks, permanent plunge pools within intermittent creeks, seeps, and springs. Aquatic habitat used for breeding usually has a minimum deep water depth of 20 inches, and maintains water during the entire tadpole rearing season (at least March through July). During periods of drought, or less-than-average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but because they support breeding in wetter years these sites would still be considered essential breeding habitat. Ponds that support a small population of red-legged frogs, but are not surrounded by suitable upland habitat, or are cut off from other breeding ponds or permanent water sources by impassable dispersal barriers, do not have the primary constituent elements for proposed California red-legged frog critical habitat.

To be a primary constituent element for California red-legged frog proposed critical habitat, the aquatic components within the designated boundaries must include two or more breeding sites (as defined above) located within 1.25 miles of each other; at least one of the breeding sites must also be a permanent water source; or, the aquatic component can consist of two or more seasonal breeding sites with a permanent non-breeding water source located within 1.25 miles of each breeding site. California red-legged frogs have been documented to travel 2.25 miles in a virtual straight line migration from non-breeding to breeding habitats (U.S. Fish and Wildlife Service 2001a). In addition, breeding sites must be connected by dispersal habitat connecting essential aquatic habitat, described below.

Associated upland and riparian habitat is essential to maintain California red-legged frog populations associated with essential aquatic habitat. The associated uplands and riparian habitat provide food and shelter sites for California red-legged frogs, and assist in maintaining the integrity of aquatic sites by protecting them from disturbance and supporting the normal functions of the aquatic habitat. Key conditions include the timing, duration, and extent of water moving within the system, filtering capacity, and maintaining the habitat to favor red-legged frogs and discourage the colonization of nonnative species such as bullfrogs. Essential upland habitat consists of all upland areas within 300 feet, or no further than the watershed boundary, of the edge of the ordinary high-water mark of essential aquatic habitat (U.S. Fish and Wildlife Service 2001a).

Essential dispersal habitat provides connectivity among California red-legged frog breeding habitat (and associated upland) patches. While frogs can pass many obstacles, and do not require a particular type of habitat for dispersal, the habitat connecting essential breeding locations and other aquatic habitat must be free of barriers (e.g., a physical or biological feature that prevents frogs from dispersing beyond the feature) and at least 300 feet wide. Essential dispersal habitat consists of all upland and wetland habitat free of barriers that connects two or more patches of essential breeding habitat within 1.25 miles of one another. Dispersal barriers include heavily traveled roads (an average of 30 cars per hour from 10:00 p.m. to 4:00 a.m.) that possess no bridges or culverts; moderate to high density urban or industrial developments; and large reservoirs more than 50 acres in size. Agricultural lands such as row crops, orchards, vineyards, and pastures do not constitute barriers to California red-legged frog dispersal.

Dispersal habitat connecting essential aquatic habitat. Essential dispersal habitat provides connectivity among red-legged frog breeding habitat (and associated upland) patches. While frogs can pass many obstacles, and do not require a particular type of habitat for dispersal, the habitat connecting essential breeding locations and other aquatic habitat must be free of barriers (*e.g.*, a physical or biological feature that prevents frogs from dispersing beyond the feature) and at least 300 feet wide. Essential dispersal habitat consists of all upland and wetland habitat free of barriers that connects two or more patches of essential breeding habitat within 1.25 miles of one another. Dispersal barriers include heavily traveled roads (an average of 30 cars per hour from 10:00 p.m. to 4:00 a.m.) that possess no bridges or culverts; moderate to high density urban or industrial developments; and large reservoirs more than 50 acres in size. Agricultural lands such as row crops, orchards, vineyards, and pastures do not constitute barriers to red-legged frog dispersal.

The Pigeon Pass Project occurs within the East Bay-Diablo Range unit (Unit 15), which consists of watersheds within Contra Costa, Alameda, San Joaquin, Santa Clara, Stanislaus, San Benito, Merced, and Fresno counties. The boundary of Unit 15 encompasses approximately 1.05 million acres, of which approximately 87 percent is privately owned. The remaining 13 percent is managed, in part, by various Federal, State, and local land and water management agencies. Because essential aquatic habitat, associated uplands, and essential dispersal habitat has not been widely mapped in the unit, the Service can not accurately estimate the area within the unit that supports primary constituent elements. However, due to the presence of high use roads and

developed areas as well as substantial areas without permanent water, we anticipate that the effective area of Unit 15 will be considerably less than 1.05 million acres.

Unit 15 has been affected by activities that destroy essential aquatic and upland habitats, and dispersal habitats providing connectivity between subpopulations. Degradation and loss of these habitats have occurred through urbanization, mining, inappropriate management of grazing, recreation, invasion of nonnative plants, impoundments, water diversions, degraded water quality, and introduced predators.

The action area is relatively undeveloped, and it contains State Route 84, Ruby Hills and Vineyard Estates developments, and several ranches. The surrounding habitat includes several vegetation communities, including valley oak woodland, annual non-native grassland, seasonally wetted areas with associated vegetation, and ponds. A 60-acre California red-legged frog/California tiger salamander mitigation site for the Ruby Hills/Vineyard Estates consists of a series of artificial ponds connected by drainages, and the surrounding upland habitat. As described in the Biological Assessment, essentially all undeveloped lands on and adjacent to the project site contain the constituent elements of proposed California red-legged frog critical habitat, including essential aquatic habitat, associated uplands, and essential dispersal habitat.

Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp was listed as threatened on September 19, 1994 (U.S. Fish and Wildlife Service 1994). Simovich *et al.* (1992) and Ericksen and Belk (1999) provide further details about the life history and ecology of this species.

The vernal pool fairy shrimp has a delicate elongate body, large stalked compound eyes, no carapace, and 11 pairs of swimming legs. It swims or glides gracefully upside down by means of complex beating movements of the legs that pass in a wave-like anterior to posterior direction. Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus. The females carry the eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The "resting" or "summer" eggs are capable of withstanding heat, cold, and prolonged desiccation. When the pools fill in the same or subsequent seasons, some, but not all, of the eggs may hatch. The egg bank in the soil may consist of eggs from several years of breeding (Donald 1983). The eggs hatch when the vernal pools fill with rainwater. The early stages of the vernal pool fairy shrimp develop rapidly into adults. These non-dormant populations often disappear early in the season long before the vernal pools dry up.

The vernal pool fairy shrimp inhabits vernal pools with clear to tea-colored water, most commonly in grass or mud-bottomed swales, or basalt flow depression pools in unplowed grasslands. The vernal pool fairy shrimp has been collected from early December to early May. It can mature quickly, allowing populations to persist in short-lived shallow pools (Simovich *et al.* 1992). Vernal pool fairy shrimp occupy a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools (Eng *et al.* 1990; Helm 1998; California Department of Fish and Game 2001). The pool types where the

species has been found include Northern Hardpan, Northern Claypan, Northern Volcanic Mud Flow, and Northern Basalt Flow vernal pools formed on a variety of geologic formations and soil types. Although vernal pool fairy shrimp have been collected from large vernal pools, including one exceeding 25 acres in area (Eriksen and Belk 1999), it is most frequently found in pools measuring fewer than 0.05 acre in area (Helm 1998; Gallagher 1996). The species occurs at elevations from 33 feet to 4,003 feet (Eng *et al.* 1990), and is typically found in pools with low to moderate amounts of salinity or total dissolved solids (Keeley 1984; Syrdahl 1993). Vernal pools are mostly rain fed, resulting in low nutrient levels and dramatic daily fluctuations in pH, dissolved oxygen, and carbon dioxide (Keeley and Zedler 1998). Although there are many observations of the environmental conditions where vernal pool fairy shrimp have been found, there have been no experimental studies investigating the specific habitat requirements of this species.

The hydrology that maintains the pattern of inundation and drying characteristic of vernal pool habitats is complex. Vernal pool habitats form in depressions above an impervious soil layer (duripan) or rock substrate. After winter rains begin, this impervious layer prevents the downward percolation of water and creates a perched water table causing the depression (or pool) to fill. Due to local topography and geology, the depressions are generally part of an undulating landscape, where soil mounds are interspersed with basins, swales, and drainages (Nikiforoff 1941; Holland and Jain 1978). These features form an interconnected hydrological unit known as a vernal pool complex. Although vernal pool hydrology is driven by the input of precipitation, water input to vernal pool basins also occurs from surface and subsurface flow from the swale and upland portions of the complex (Zedler 1987, Hanes *et al.* 1990, Hanes and Stromberg 1998). Surface flow through the swale portion of the complex allows vernal pool species to move directly from one vernal pool to another. Upland areas are a critical component of vernal pool hydrology because they directly influence the rate of vernal pool filling, the length of the inundation period, and the rate of vernal pool drying (Zedler 1987; Hanes and Stromberg 1998).

The vernal pool fairy shrimp has evolved unique physical adaptations to survive in vernal pools. Vernal pool environments are characterized by a short inundation phase during the winter, a drying phase during the spring, and a dry phase during the summer (Holland and Jain 1978). The timing and duration of these phases can vary significantly from year to year, and in some years vernal pools may not inundate at all. In order to take advantage of the short inundation phase, vernal pool crustaceans have evolved short reproduction times and high reproductive rates. The listed crustaceans generally hatch within a few days after their habitats fill with water, and can start reproducing within a few weeks (Eng *et al.* 1990; Helm 1998; Eriksen and Belk 1999). Vernal pool crustaceans can complete their entire life cycle in a single season, and some species may complete several life cycles. Vernal pool crustaceans can also produce numerous offspring when environmental conditions are favorable. Some species may produce thousands of cysts during their life spans.

To survive the prolonged heat and dessication of the vernal pool dry phase, vernal pool crustaceans have developed a dormant stage. After vernal pool crustacean eggs are fertilized in the female's brood sac, the embryos develop a thick, usually multi-layered shell. When embryonic development reaches a late stage, further maturation stops, metabolism is drastically

slowed, and the egg, now referred to as a cyst, enters a dormant state called diapause. The cyst is then either dropped to the pool bottom or remains in the brood sac until the female dies and sinks. Once the cyst is desiccated, it can withstand temperatures near boiling (Carlisle 1968), fire (Wells *et al.* 1997), freezing, and anoxic conditions without damage to the embryo. The cyst wall cannot be affected by digestive enzymes, and can be transported in the digestive tracts of animals without harm (Horne 1967). Most fairy shrimp cysts can remain viable in the soil for a decade or longer (Belk 1998).

Although the exact signals that cause crustacean cysts to hatch are unknown, factors such as soil moisture, temperature, light, oxygen, and osmotic pressure may trigger the embryo's emergence from the cyst (Brendonck 1996). Because the cyst contains a well developed embryo, the animal can quickly develop into a fully mature adult. This allows vernal pool crustaceans to reproduce before the vernal pool enters the dry phase, sometimes within only a few weeks (Helm 1998, Eriksen and Belk 1999). In some species, cysts may hatch immediately without going through a dormant stage, if they are deposited while the vernal pool still contains water. These cysts are referred to as quiescent, and allow the vernal pool crustacean to produce multiple generations in a single wet season as long as their habitat remains inundated.

Another important adaptation of vernal pool crustaceans to the unpredictable conditions of vernal pools is the fact that not all of the dormant cysts hatch in every season. Hathaway and Simovich (1996) found that only 6 percent of endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*) cysts hatched after initial hydration, and only 0.18 percent of Riverside fairy shrimp cysts hatched. The cysts that don't hatch remain dormant and viable in the soil. These cysts may hatch in a subsequent year, and form a cyst bank much like the seed bank of annual plants. The cyst bank may be comprised of cysts from several years of breeding, and large cyst banks of viable resting eggs in the soil of vernal pools containing fairy shrimp have been well documented (Belk 1998). Based on a review of other studies (e.g. Belk 1977; Gallagher 1996, Brendonck 1996), Hathaway and Simovich (1996) concluded that species inhabiting more unpredictable environments, such as smaller or shorter lived pools, are more likely to have a smaller percent of their cysts hatch after their vernal pool habitats fill with water. This strategy reduces the probability of complete reproductive failure if a vernal pool dries up prematurely. This kind of "bet-hedging strategy" has been suggested as a mechanism by which rare species may persist in unpredictable environments (Chesson and Huntly 1989; Ellner and Hairston 1994).

Upland areas associated with vernal pools are also an important source of nutrients to vernal pool organisms (Wetzel 1975). Vernal pool habitats derive most of their nutrients from detritus which is washed into the pool from adjacent uplands, and these nutrients provide the foundation for vernal pool aquatic communities food chain. Detritus is a primary food source for the vernal pool crustaceans (Eriksen and Belk 1999).

Vernal pool fairy shrimp generally will not hatch until water temperatures drop to below 50°F (Gallagher 1996; Helm 1998). This species is capable of hatching multiple times within a single wet season if conditions are appropriate. Helm (1998) observed 6 separate hatches of vernal pool

fairy shrimp within a single wet season, and Gallagher (1996) observed 3 separate hatches in vernal pools in Butte County.

Helm (1998) observed vernal pool fairy shrimp living for as long as 147 days. The species can reproduce in as few as 18 days at optimal conditions of 68°F and can complete its life cycle in as little as 9 weeks (Gallagher 1996; Helm 1998). However, maturation and reproduction rates of vernal pool crustaceans are controlled by water temperature and can vary greatly (Eriksen and Brown 1980; Helm 1998). Helm (1998) observed that vernal pool fairy shrimp did not reach maturity until 41 days at water temperatures of 59°F. Vernal pool fairy shrimp has been collected at water temperatures as low as 40°F (Eriksen and Belk 1999), however, the species has not been found in water temperatures above about 73°F (Helm 1998; Eriksen and Belk 1999).

The vernal pool fairy shrimp is known from 32 populations extending from Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County, and along the central coast range from northern Solano County to Pinnacles in San Benito County (Eng et al. 1990; Fugate 1992; Sugnet and Associates 1993) and a disjunct population on the Agate Desert in Oregon. Five additional, disjunct populations exist: one near Soda Lake in San Luis Obispo County; one in the mountain grasslands of northern Santa Barbara County; one on the Santa Rosa Plateau in Riverside County, one near Rancho California in Riverside County and one on the Agate Desert near Medford, Oregon. Three of these isolated populations each contain only a single pool known to be occupied by the vernal pool fairy shrimp. The genetic characteristics of these species, as well as ecological conditions, such as watershed continuity, indicate that populations of these animals are defined by pool complexes rather than by individual vernal pools (Fugate 1992). Therefore, the most accurate indication of the distribution and abundance of these species is the number of inhabited vernal pool complexes. Individual vernal pools occupied by these species are most appropriately referred to as subpopulations.

The primary historic dispersal method for the vernal pool fairy shrimp likely was large scale flooding resulting from winter and spring rains which allowed the animals to colonize different individual vernal pools and other vernal pool complexes. This dispersal currently is non-functional due to the construction of dams, levees, and other flood control measures, and widespread urbanization within significant portions of the range of this species. Waterfowl and shorebirds likely are now the primary dispersal agents for vernal pool tadpole shrimp and vernal pool fairy shrimp (Brusca in. litt.; 1992, King in. litt., 1992; Simovich in. litt., 1992). The eggs of these crustaceans are either ingested (Krapu 1974; Swanson *et al.* 1974; Driver 1981; Ahl 1991) and/or adhere to the legs and feathers where they are transported to new habitats.

Vernal pool crustaceans are often dispersed from one pool to another through surface swales that connect one vernal pool to another. These dispersal events allow for genetic exchange between pools and create a population of animals that extends beyond the boundaries of a single pool. Instead, populations of vernal pool crustaceans are defined by the entire vernal pool complex in which they occur (Simovich *et al.* 1992, King 1996). These dispersal events also allow vernal pool crustaceans to move into pools with a range of sizes and depths. In dry years, animals may only emerge in the largest and deepest pools. In wet years, animals may be present in all pools,

or in only the smallest pools. The movement of vernal pool crustaceans into vernal pools of different sizes and depths allows these species to survive the environmental variability that is characteristic of their habitats.

Vernal pool crustaceans are an important food source for a number of aquatic and terrestrial species. Aquatic predators include insects such as backswimmers (Woodward and Kiesecker 1994), predaceous diving beetles and their larvae, and dragonflies and damselfly larvae. Vernal pool tadpole shrimp are another significant predator of fairy shrimp. Vernal pools provide important habitat for resident and migratory birds, particularly waterfowl and shorebirds. Birds are particularly attracted to the pools because they offer foraging habitat at a time of year when resources are limited (Silveira 1998), and vernal pools help link aquatic resources in the California portion of the Pacific Flyway. Vernal pool crustaceans provide important proteins and calcium vital to the energetic needs of migratory bird migration and reproduction (Proctor *et al.* 1967; Silveira 1998). Vernal pool crustaceans are a major food source for a number of terrestrial vertebrate predators including water fowl, wading birds, toads, frogs, and salamanders (Proctor *et al.* 1967; Krapu 1974; Swanson 1974; Morin 1987; Simovich *et al.* 1991; Silveira 1998). Vernal pool crustaceans depend on the absence of water during the summer months to discourage aquatic predator species such as bullfrogs, garter snakes, and fish (Eriksen and Belk 1999).

The vernal pool fairy shrimp is imperiled by a variety of human-caused activities, primarily urban development, water supply/flood control projects, and land conversion for agricultural use. Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, and other activities, as well as modification of surrounding uplands which alters vernal pool watersheds. Other activities which adversely affect these species include off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use.
The main threat to listed vernal pool crustaceans is the loss of habitat associated with human activities, including urban/suburban development, water supply/flood control development, and conversion of natural lands to intensively farmed agricultural uses. According to the 1997 National Resources Inventory, released by the Natural Resources Conservation Service (1999), California ranked sixth in the nation in number of acres of private land developed between 1992 and 1997, at nearly 695,000 acres. Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, and other activities, as well as modification of surrounding uplands which alters vernal pool watersheds. Other activities which adversely affect these species include off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use, alterations of vernal pool hydrology, fertilizer and pesticide contamination, activity, invasions of aggressive non-native plants, gravel mining, and contaminated stormwater runoff. State and local laws and regulations do not protect listed vernal pool crustaceans, while other laws and regulations, including the Clean Water Act, have not effectively maintained habitat necessary to conserve and recover these species. Although developmental pressures continue, only a small fraction of vernal pool habitat is protected from the threat of destruction.

Holland (1978) estimated that between 67 and 88 percent of the area within the Central Valley of California which once supported vernal pools had been destroyed by 1973. However, an analysis of this report by the Service revealed apparent arithmetic errors which resulted in a determination

that a historic loss between 60 and 85 percent may be more accurate. Regardless, in the ensuing years, threats to this habitat type have continued and resulted in a substantial amount of vernal pool habitat being converted for human uses in spite of Federal regulations implemented to protect wetlands. For example, the Corps' Sacramento District has authorized the filling of 467 acres of wetlands between 1987 and 1992 pursuant to Nationwide Permit 26 (U.S. Fish and Wildlife Service 1992). The Service estimates that a majority of these wetland losses within the Central Valley involved vernal pools, the habitat of the vernal pool tadpole shrimp and vernal pool fairy shrimp. Current rapid urbanization and agricultural conversion throughout the ranges of these two species continue to pose the most severe threats to the continued existence of the vernal pool tadpole shrimp and vernal pool fairy shrimp. The Corps' Sacramento District has several thousand vernal pools under its jurisdiction (Coe 1988), which includes most of the known populations of these listed species. It is estimated that within 20 years 60 to 70 percent of these pools will be destroyed by human activities (Coe 1988).

In addition to direct habitat loss, the vernal pool habitat for the vernal pool tadpole shrimp and vernal pool fairy shrimp has been and continues to be highly fragmented throughout their ranges due to conversion of natural habitat for urban and agricultural uses. This fragmentation results in small isolated vernal pool tadpole shrimp and vernal pool fairy shrimp populations. Ecological theory predicts that such populations will be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1986; Goodman 1987a, 1987b). If an extirpation event occurs in a population that has been fragmented, the opportunities for recolonization would be greatly reduced due to physical (geographical) isolation from other (source) populations.

In addition to direct habitat loss, the vernal pool habitat for this listed vernal pool crustacean is also highly fragmented throughout their ranges due to the nature of vernal pool landscapes and the conversion of natural habitat by human activities. Such fragmentation results in small, isolated populations of listed crustaceans which may be more susceptible to extinction due to random demographic, genetic, and environmental events. Should an extirpation event occur in a population that has been fragmented, the opportunities for recolonization would be greatly reduced due to physical (geographical) isolation from other (source) populations.

Vernal pools and ephemeral wetlands are found at seven sites in the action area of the Pigeon Pass Project (California Department of Transportation 2004). Service-approved protocols for sampling for the listed crustacean were not followed at the proposed project. Two of the seven sites were not sampled for vernal pool crustaceans because they were located more than 250 feet from the construction area. Back-to-back dry and wet season surveys were conducted at the remaining five sites (California Department of Transportation 2004). Cysts of fairy shrimp of the genus *Branchinecta* were found at one of the pools; however, the specific identity was not determined. This vernal pool is in the right-of-way and cut-and-fill limits for the Pigeon Pass Project, and will be partially filled as a result of the proposed action. Surveys were discontinued at one of the sites when California red-legged frog egg masses were discovered, however, that site is over 250 feet from the zone of disturbance. The vernal pool fairy shrimp has been recorded within 7 miles of the proposed project (California Department of Fish and Game 2004) and suitable habitat for this listed animal is found in the action area of the project. Therefore, the

Service has determined it is reasonable to conclude the vernal pool fairy shrimp occurs in the action area because of the biology and ecology of the species, the presence of suitable habitat, as well as the nearby observations of this listed crustacean.

Effects of the Proposed Action

The proposed Pigeon Pass Project likely will result in a number of adverse effects to the San Joaquin kit fox, California tiger salamander, California red-legged frog, and the vernal pool fairy shrimp. There is a likelihood the animals may be affected by being crushed, entombed in their burrows, their cysts buried or crushed, hit and injured or killed by vehicle strikes, being shot, chased and injured or killed by domestic pet dogs, poisoned by chemical agents, trapped in erosion control netting, or harassed by noise and vibration. The San Joaquin kit fox, California red-legged frog, and California tiger salamander may be adversely affected by the proposed project blocking travel corridors, or by evening construction disturbing night time foraging, mating, movement, or subjecting them to predation that otherwise would not occur. These four listed animals inhabit the project site and surrounding vicinity (for purposes of this biological opinion the surrounding vicinity is described as 1000 feet outside and adjacent to the project footprint) are likely to be subject to indirect effects including loss of habitat, pesticide or chemical poisoning, exotic predators, competitors, and non-native plants, disease, and a reduction in natural food sources as a result of habitat disturbance and loss.

Temporary effects are project activities that temporarily remove one or more essential components of the habitat of a listed species, but can be restored to pre-project conditions of equal or greater habitat value. In order for the effects to be considered temporary, the affected habitat of the listed species must be totally restored within two seasons. Ground disturbance resulting from the proposed Pigeon Pass Project includes substantial grading, excavating, and fill. The California Department of Transportation is considering the adverse effects of the cut and fill of 17,655,367 cubic feet of earth to be of a temporary nature. This amount of cut and fill has potential to cause injury and mortality to individual San Joaquin kit foxes, California tiger salamanders, and the California red-legged frogs occupying the action area, and these areas likely will not be suitable for use as habitat for foraging, breeding, resting and other essential behaviors by these three animals for a significant period of time, almost certainly longer than two seasons after the construction of the project is completed.. As part of the project description, the California Department of Transportation has stated upon completion of the project, they will re-contoured temporally affected habitat areas if necessary, and revegetate them to promote restoration of the area to pre-project conditions. The temporary effects will result in the permanent loss of the habitat utilized by these three listed animal species unless the restoration implemented the California Department of Transportation is adequately planned, utilizes native California plant species collected in the immediate area of the proposed project, and meets specific success criteria.

The proposed Pigeon Pass Project includes two oversized culverts that that will allow adjacent landowners to access their properties, and also twelve drainage culverts. The California Department of Transportation has stated these undercrossing and culverts will function as wildlife movement corridors but adequate information was not made available to the Service on

such factors as the sizes or other data that would have allowed an adequate evaluation of the effectiveness of this proposed conservation measure.

Construction equipment that has been used in different areas and with different species of amphibians including the California tiger salamander and the California red-legged frog may transmit diseases by introducing contaminated soil and other material on the equipment. The chance of a disease being introduced into a new area is greater today than in the past due to the increasing occurrences of disease throughout amphibian populations in California and the United States. It is possible that chytrid fungus may exacerbate the effects of other diseases on amphibians or increase the sensitivity of the amphibian to environmental changes (*e.g.*, water pH) that reduce normal immune response capabilities (Bosch *et al.* 2000).

This conference opinion on the proposed critical habitats for the California tiger salamander and the California red-legged frog does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR § 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service* (No. 03-35279) to complete the following analysis with respect to the proposed critical habitats.

San Joaquin Kit Fox

Individual San Joaquin kit foxes may be directly injured or killed by activities that disturb feeding, breeding, and sheltering habitat. The proposed project would (1) result in the permanent loss of 17.3 acres and the temporary loss of 61.9 acres of San Joaquin kit fox habitat; (2) result in the possible injury and death of an unknown number of San Joaquin kit foxes; (3) result in construction-related harassment to the surviving San Joaquin kit foxes on the site; (4) impede the dispersal of San Joaquin kit foxes through the site while the action is in progress; (5) increase the likelihood of predation on San Joaquin kit foxes; and (6) fragment and reduce the amount of San Joaquin kit fox habitat in the northern portion of the range of this species

Construction related activities are likely to cause disruption of foraging, disruption or complete loss of reproduction, harassment from increased human activity, and permanent and temporary loss of shelter. Because these animals are nocturnal, when construction is performed at night, associated lighting likely would increase all of the above effects. Lighting associated with night construction will also increase the likelihood of predation on San Joaquin kit foxes by removing the cover of darkness. The animals that avoid construction activities may become displaced into adjacent areas. Nocturnally active mammalian predators may be vulnerable to increased predation, exposure, starvation, or stress through disorientation, loss of shelter, and intraspecific and interspecific aggression (Grigione 2002).

Range-wide habitat loss, fragmentation, and degradation from multiple factors is the primary threat to the San Joaquin kit fox (U.S. Fish and Wildlife Service 1998). Approximately 95% of native habitat for kit fox habitat in the San Joaquin Valley ha been destroyed by agricultural, industrial, and urban development (U.S. Fish and Wildlife Service 1998). Loss of natural lands continues to occur further reducing the habitat available for the animal. The amount of historical

and current habitat loss directly attributable to road has not been calculated. Estimates of the area occupied by roads under the jurisdiction of California Department of Transportation includes 591 acres for Kings County, 431 hectares (1065 acres) for Merced County, 2019 acres for Fresno County, and 3669 acres for Kern County (Cypher 2000). These estimates are based on a standard lane width of 11.8 feet, and not all of this area is in kit fox habitat. However, the estimates do not include road shoulders, medians, or associated developments (e.g. Interchanges, signs), and also do not include the area occupied by county and city roads.

The effect of habitat fragmentation on the San Joaquin kit fox is potentially significant and likely will: (1) reduce access to habitat as well as habitat suitability, and (2) disrupt movement, dispersal, and gene flow. The construction of roads through San Joaquin kit fox habitat may restrict or block access to adjacent and formerly contiguous habitat patches. The likelihood of this effect increases with larger road size, higher traffic volume, and the presence of fences or median barriers. Knapp (1978) monitored movements of radio-collared San Joaquin kit foxes in the vicinity of Interstate 5 in Kern County. Many of the foxes used areas within 2 miles of the highway, and most exhibited movement and home range patterns that parallel the highway, but did not cross it. Only on 2 occasions were animals located on the opposite side of the highway from their primary area of use. Interstate 5 has an effect on kit fox use patterns and restricts movements by the San Joaquin kit fox between habitat blocks.

In addition to limiting access to habitat patches, roads also may reduce the suitability of habitat for San Joaquin kit foxes by fragmentation into patches too small for effective use by the animals. As a habitat patch decreases in size, the number of San Joaquin kit foxes the patch can support also decreases. This increases the probability that the animals will be extirpated from each patch. The possibility for recolonization will depend upon the nature of the factors, e.g., roads, canals, development, etc., that are causing the fragmentation. Estimates of home range size for the San Joaquin kit fox vary from 1.7 square miles to 4.5 square miles (White and Ralls 1993). Typically, a mated pair will share a home range. If a habitat fragment is too small to support a home range, it may be abandoned by the animals. Whether or not the patch can be used as part of a San Joaquin kit fox home range will depend upon the nature of the factors causing the fragmentation.

Fragmentation factors that effectively isolate patches and limit access also constitute barriers to San Joaquin kit fox movements, dispersal, and gene flow. Movements and dispersal corridors are critical to kit fox population dynamics, particularly because the animals currently persist as metapopulations with multiple disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition during years when San Joaquin kit fox abundance is high, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects.

Roads have been documented as barriers to movements by a diversity of species, and this effect varies with road size and traffic volume. Bobcats (*Felis rufus*) in Wisconsin readily crossed dirt roads, but were reluctant to cross paved roads (Lovallo and Anderson 1996). Lynx also exhibit a

reluctance to cross roads (Barnum 1999) as do mountain lions (*Felis concolor*)(Van Dyke *et al.* 1986). In a study in North Carolina, the number of road crossings by black bears (*Ursus americanus*) was inversely related to traffic volume, and bears almost never crossed an interstate highway (Brody and Pelton 1989). Endangered Sonoran pronghorn (*Antilocarpa americana*) in Mexico are reluctant to cross a 2-lane highway, and the planned expansion of the road could further restrict movements (Castillo-Sanchez 1999). Many rodents are reluctant to cross roads (Oxley *et al.* 1974).

The inhibition of animal movements caused by roads produces a significant effect by fragmenting habitats and populations (Joly and Morand 1997). Roads were found to be significant barriers to gene flow among common frogs (*Rana temporaria*) in Germany and this has resulted in genetic differentiation among populations separated by roads (Reh and Seitz 1990). Similarly, significant genetic subdivision was detected in bank voles (*Clethrionomys glarelous*) populations separated by a 50-meter (164 foot) wide highway in Germany (Gerlach and Musolf 2000). In California, local extirpations of mountain lions has occurred when roads and other developments fragmented habitat in small patches and blocked movement corridors thereby isolating the patches and preventing recolonization (Beier 1993). Adequately sized culverts or undercrossings with suitable habitat at each side of the passage significantly increases the ability of mammals to cross highways (Ng *et al.* 2003).

San Joaquin kit fox mortality and injury occurs when the animals attempt to cross roads and are hit by cars, trucks, or motorcycles. The majority of strikes likely occur at night when the animals are most active. Driver visibility also is lower at night increasing the potential for strikes. Such strikes are usually fatal for an animal the size of a San Joaquin kit fox. Thus, vehicle strikes are a direct source of mortality for this listed canine. If vehicle strikes are sufficiently frequent in a given locality, they could result in reduced San Joaquin kit fox abundance. The death of animals during the November-January breeding season could result in reduced reproductive success. Death of females during gestation or prior to pup weaning could result in the loss of an entire litter of young, and therefore, reduced recruitment of new individuals into the population.

Occurrences of vehicle strikes involving San Joaquin kit foxes have been well documented, and such strikes occur throughout the range of the species. Sources of kit fox mortality were examined during 1980-1995 at the Naval Petroleum Reserve in California in western Kern County (Cypher *et al.* 2000). During this period, 341 adult San Joaquin kit foxes were monitored using radio telemetry, and 225 of these animals were recovered dead. Of these, 20 were struck by vehicles; 9% of adult kit mortalities were attributed to vehicles, and 6% of all monitored adults were killed by vehicles. During this same period, 184 juvenile (<1 year old) kit foxes were monitored. Of these, 142 were recovered dead and 11 were killed by vehicles; 8% of juvenile kit fox mortalities were attributed to vehicles and 6% of all monitored juveniles were killed by vehicles. For both adults and juveniles, vehicle strikes accounted for less than 10% of all San Joaquin kit fox deaths in most years. However, in some years, vehicles accounted for about 20% of deaths. Predators, primarily coyotes and bobcats, were the primary source of mortality at the Naval Petroleum Reserves. In addition, 70 kit foxes, both radio collared and non-collared, were found dead on roads in and around the Naval Petroleum Reserve during 1980-1991 (U.S. Department of Energy 1993). Of these, 34 were hit by vehicles on the approximately

1,600 kilometers (990 miles) of roads at the Reserve, and 36 were struck on the approximately 80 kilometers (50 miles) of State and County roads (e.g., State Route 119, Elk Hills Road), where traffic volumes and average vehicle speeds were higher.

In other areas of western Kern County, 49 kit foxes were radio-collared in the highly developed Midway-Sunset oil field, and 54 kit foxes were radio-collared in the Lokern Natural Area, a nearby undeveloped area, during 1989-1993 (Spiegel and Disney 1996). Of these animals, 60 were recovered dead; 1 (2%) was killed by a vehicle, and it was found in an undeveloped area along the access road adjacent to the California aqueduct. However, 6 non-collared kit foxes were killed by vehicles on the access road. Predators, primarily coyotes, bobcats, and feral dogs were responsible for most deaths in this study. Forty-one San Joaquin kit foxes were radio-collared and monitored during 1989-1991 on the Carrizo Plain Natural Area in eastern San Luis Obispo County (Ralls and White 1995). Twenty-two were found dead; 1 (5%) were attributed to a vehicle strike. At the Camp Roberts National Guard Training Facility in Monterey and San Luis Obispo counties, 94 San Joaquin kit foxes were radio-collared during 1988-1992 (Standley *et al.* 1992). Forty-nine were found dead and 2 were attributed to vehicle strikes; 4% of the deaths were caused by vehicles and 2% of all monitored kit foxes were killed by vehicles. In western Merced County, 28 San Joaquin kit foxes were radio-collared during 1985-1987 (Briden *et al.* 1992). Seventeen were found dead and 2 (12%) of these deaths were attributed to vehicles. In the City of Bakersfield, 113 San Joaquin kit foxes were radio-collared and monitored during 1997-2000 (Cypher 2000). Thirty-five were recovered dead (123 adults and 12 pups); 9 adults (39%) and 6 pups (50%) were attributed to vehicle strikes. At this urban site, coyotes and bobcats are rare, and vehicles are the primary source of kit fox mortality. However, survival rates are higher than rates among kit foxes in non-urban areas, and vehicles do not appear to be limiting the population size.

Vehicles constitute a consistent source of mortality for the animal, based on the frequency with which vehicle strikes occur. However, the precise effect of vehicle strikes on the San Joaquin kit fox has not been adequately investigated. According to Morrell (1970), "The automobile is by far the major cause of reported San Joaquin kit fox deaths - 128 of 152 deaths reported were caused by automobiles." Morrell acknowledged that the numbers were based on non-radio-collared kit foxes and therefore were biased because road-killed foxes are conspicuous and easily observed compared to animals dying from other causes. Predators such as coyotes, bobcats, non-native red foxes, and domestic dogs likely constitute a higher source of mortality than vehicle strikes (U.S. Fish and Wildlife Service 1998; Cypher 2000).

The local and range-wide effects of vehicle strikes on San Joaquin kit foxes have not been adequately assessed. Vehicle strikes appear to occur most frequently where roads transverse areas where the animals are abundant. However, the linear quantity of roads in a given area may not be directly related to the number of vehicle strikes in a given area, as exemplified by the situation at the Naval Petroleum Reserve. The type of road (e.g., number of lanes) traffic volume, and average speed of vehicles likely all influence the number of San Joaquin kit fox/vehicle strikes. The number of strikes likely increases with road size, traffic volume, and average speed (Clevenger and Waltho 1999). Another factor influencing the number of vehicles striking this endangered mammal, but for which little data is available, is the frequency with

which the animals cross roads and are therefore at risk. The proportion of successful road crossings by these animals likely declines with increasing road size, traffic volume and density, and vehicle speeds. The proportion of San Joaquin kit foxes successfully crossing roads may increase in areas where they obtain more experience crossing roads, such as in and near urban areas.

Based on a study of another kit fox subspecies, Egoscue (1962) reported that 8 tagged foxes (*Vulpes macrotis nevadensis*) in Utah were killed by vehicles, and 5 of these were pups. Pups appeared to be more vulnerable to vehicle strikes. Many of the foxes killed were residents that were using dens located near roads. O'Neal *et al* (1987) examined 23 dead kit foxes in western Utah in 1983. None were killed by vehicles, possibly due to the remoteness of the study site.

Swift foxes (*Vulpes velox*) are closely related to the San Joaquin kit fox, and are listed as an endangered in Canada. They show numerous ecological similarities with the San Joaquin kit fox. Hines (1980) reported that roads were a major source of swift fox mortality in Nebraska. In Alberta, where the swift fox was extirpated and recently reintroduced, vehicles were responsible for 5 of 89 (6%) of the foxes found dead (Cabyn *et al* 1994). Pups appeared to be especially vulnerable, particularly if the natal dens were located near roads (Cabyn 1998). In western Kansas, 41 adults and 24 juvenile swift foxes were radio collared and monitored during 1996-97 on 2 study sites (Sovada *et al* 1998). Among the adults, 18 were found dead, but none were killed by vehicles. Among the juveniles, 14 were found dead and 4 (29%) of these had been struck by vehicles. All 7 of the juveniles killed by vehicles were found on the same study site. This study site had 90% more roads compared to the other study site where no foxes were killed by vehicles (78 miles vs. 41 miles). At a remote site in Colorado with few roads and restricted public access, swift foxes were rarely struck by vehicles (Covell 1992; Kitchen *et al.* 1999).

Vehicle-related mortality has significantly affected other listed or rare species. Vehicles caused 49% of the mortality documented among endangered Florida panthers (*Felis concolor coryi*) (Maehr *et al.* 1991). With a small remaining population, the loss of any individuals to vehicles could constitute a significant population effect. Similarly, at least 15% of the remaining 250-300 key deer (*Odocileus virginianus clavium*) are killed annually by vehicles (Tubak 1999), and this mortality is considered to be a limiting factor for this endangered species (U.S. Fish and Wildlife Service 1985). Mortality from vehicles was the primary source of mortality for endangered ocelots (*Felis pardalis*) in Texas (Tubak 1999), and also contributed to the failure of a lynx (*Lynx lynx*) reintroduction project in New York (Aubrey *et al.* 1999). Rudolph *et al.* (1999) estimated that road-associated mortality may have depressed populations of Louisiana pine snakes (*Pituophis ruthveni*) and timber rattlesnakes (*Crotalus horridus*) by over 50% in eastern Texas, and this mortality may be a primary factor in local extirpations of timber rattlesnakes (Rudolph *et al.* 1998). Mortality from vehicles also is contributing to the reduction in the status of the prairie garter snake (*Thamnophis radix radix*) in Ohio (Dalrymple and Reichenbach 1984), and was a limiting factor in the recovery of the endangered American crocodile (*Crocodylus acutus*) in Florida (Kushland 1998). In Florida, threatened Florida scrub-jays (*Aphelocoma coerulescens*) suffered higher mortality in territories near roads, as well as reduced productivity due to vehicle strikes of both breeding adults and young (Mumme et al. 1999).

Construction, maintenance, and operational activities associated with roads may result in a disturbance effect on nearby San Joaquin kit foxes. Disturbance can result from noise, vibration, odors, or human activity. Disturbance may affect the kit foxes by interfering with sensory perception which could interfere with their ability to locate prey, pups, or mates, or detect approaching predators. Disturbance could induce stress which may affect physiological parameters or behavior. The resulting effects could include increase energetic requirements, decrease reproductive output, decrease immunological functions, altered space use patterns, displacement, or possibly death. Observations from a variety of sources and situations suggest that San Joaquin kit foxes may not be significantly affected by disturbance, even when the source is prolonged or continuous (Cypher 2000). However, individual animals may be more affected than others, and it is unknown whether disturbance may result in reduced local abundance.

An increase in the ambient noise level is not, in itself, likely to cause direct harm to kit foxes. No specific research has been performed on this species but a "safe, short-term level" for humans has been determined to be 75 decibels (dBA) (NIH 1990; Burglund and Lindvall 1995). The mechanisms leading to permanent hearing damage are the same for all mammals (NIH 1990). However, the enlarged pinna and reduced tragi of kit foxes indicate that hearing is more acute than in humans (Jameson and Peeters 1988). Hearing loss in humans has been correlated with cognitive dysfunction (NIH 1990). However, variation in response to intense noise has been found to vary, in humans, by as much as 30 to 50 dBA between individuals (NIH 1990). Similar variation has been found in animal studies as well (NIH 1990). Hearing loss was greater in male than in female humans; however, this may be caused by environmental factors (NIH 1990). Also, younger animals have been shown to be more susceptible to noise-induced hearing loss (NIH 1990). The ability to habituate to noise appears to vary widely between species (NPS 1990). Typical construction machinery produces noise in the range of 75 dBA (arc-welder) to 85 dBA (bulldozer) (Burglund and Lindvall 1995). Long-term noise levels of 85 dBA are recognized to cause permanent hearing damage in humans (NIH 1990). Noise at the 85 dBA level has been correlated with hypertension in Rhesus monkeys (*Macaca fasicularis*) (Cornman 2001). Increased reproductive failure in laboratory mice (*Mus musculus*) was found to occur after a level of 82-85 dBA for one week (Cornman 2001). However, measurable loss of hearing was found to occur in chinchillas (*Chinchilla laniger*) at a sustained level of 70 dBA (Peters 1965). Hearing loss from motorcycle traffic has been documented for the kangaroo rat (*Dipodomys* species) (Bondello and Brattstrom 1979) and desert kangaroo rats (*Dipodomys deserti*) showed a significant reduction in reaction distance to the sidewinder (*Crotalus cerastes*) after exposure to 95 dBA (Cornman 2001). Other desert mammals appear to sustain the same impacts from noise (Bondello and Brattstrom 1979). Aircraft noise has produced accelerated heart-rates in pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), and elk (*Cervus elaphus*) (MacArthur 1976; Workman *et al.* 1992 both cited in U.S. National Park Service 1994).

Hearing loss is correlated with distance from the source of the noise. At a level of 110 dBA, guinea pigs (*Cavia porcellus*) suffered long-term hearing loss at distances of 75 and 150 feet, temporary loss at a distance of 100 meters, and no measurable loss at 4500 feet (Gonzales *et al.* 1970). Over water, noise is reduced at a rate of 5 dBA for each doubling of the distance to the

source (Komanoff & Shaw 2000). For instance, a noise that measured 20 dBA at 60 feet registers 10 dBA at 40 meters.

Harassment from long-term noise may cause San Joaquin kit foxes to eventually vacate the project site and adjacent areas. Endangered California condors (*Gymnogyps californianus*) have been shown to abandon nesting sites in response to vehicle noise (Shaw 1970). Grizzly bears (*Ursus arctos*), mountain goats (*Oreamnos canadensis*), caribou (*Rangifer* species), and bighorn sheep (*Ovis* spp.) have all been found to abandon foraging or calving areas in response to aircraft noise (Chadwick 1973; McCourt *et al.* 1974; Ballard 1975; Krausman and Hervert 1983; Gunn *et al.* 1985; Bleich 1990; all cited in U.S. National Park Service 1994).

Project effects on San Joaquin kit foxes are expected to be greater during the den selection, pregnancy, and early pup dependency periods of the breeding cycle (December through July) than at other times of the year. San Joaquin kit foxes may exhibit increased sensitivity to disturbance during this period and therefore, ideally, surface-disturbing activities should occur between August and November. Habitat compensation measures are anticipated to minimize habitat effects that result from implementation of the project.

The presence of roads in an area could result in the introduction of chemical contaminants to the site. Contaminants could be introduced in several ways. Substances used in road building materials or to recondition roads can leach out or wash off roads adjacent habitat. Vehicle exhaust emissions can include hazardous substances which may concentrate in soils along roads. Heavy metals such as lead, aluminum, iron, cadmium, copper, manganese, titanium, nickel, zinc, and boron are all emitted in vehicle exhaust (Trombulak and Frissell 2000). Concentrations of organic pollutants (e.. Dioxins, polychlorinated biphenyls) are higher in soils along roads (Benfenati *et al.* 1992). Ozone levels are higher in the air near roads (Trombulak and Frissell 2000). Vehicles may leak hazardous substances such as motor oil and antifreeze. Although the quantity leaked by a given vehicle may be minute, these substances can accumulate on roads and then get washed into the adjacent environment by runoff during rain storms. An immense variety of substances could be introduced during accidental spills of materials. Such spills can result from small containers falling off passing vehicles, or from accidents resulting in whole loads being spilled. Large spills may be partially or completely mitigated by clean-up efforts, depending on the substance.

San Joaquin kit foxes using areas adjacent to roads could be exposed to any contaminants that are present at the site. Exposure pathways could include inhalation, dermal contact, direct ingestion, ingestion of contaminated soil or plants, or consumption of contaminated prey. Exposure to contaminants could cause short- or long-term morbidity, possibly resulting in reduced productivity or mortality. Carcinogenic substances could cause genetic damage resulting in sterility, reduced productivity, or reduced fitness among progeny. Contaminants also may have the same effect on kit fox prey species. This could result in reduced prey abundance and diminished local carrying capacity for the kit fox.

Little information is available on the effects of contaminants on the San Joaquin kit fox. The effects may be difficult to detect. Morbidity or mortality likely would occur after the animals had

left the contaminated site, and more subtle effects such as genetic damage could only be detected through intensive study and monitoring. However, effects have been detected on some occasions. At the Naval Petroleum Reserve, 3 kit foxes are known to have been killed by drowning in spills of crude oil (Cypher *et al.* 2000). Spiegel and Disney (1996) reported that a kit fox was found covered with crude oil at the Midway-Sunset oil field, and this individual died despite treatment. Other animals, some of which were prey species for the kit fox, were found drowned in crude oil at the Naval Petroleum Reserve (U.S. Department of Energy 1993). Such spills potentially can cause local reductions in the abundance of kit foxes and their prey. Construction of roads can facilitate the invasion and establishment by species not native to the area. Disturbance and alteration of habitat adjacent to roads may create favorable conditions for non-native plants and animals. These exotic species can spread along roadsides and then into adjacent habitat. Non-native animals may use modified habitats adjacent to road to disperse into kit fox habitat. They could compete with kit foxes for resources such as food or dens, or directly injure or kill San Joaquin kit foxes. Non-native plants and animals may reduce habitat quality for the listed canine or their prey, ad reduce the productivity or the local carrying capacity for the endangered species. Introductions of non-native species could cause San Joaquin kit foxes to alter behavioral patterns by avoiding or abandoning areas near road (Cypher 2000).

Disturbed areas adjacent to roads provide favorable habitat conditions for a number of non-native plant species. Some of these taxa are aggressively invasive and they can alter natural communities and potentially affect habitat quality. A problematic species within the range of the San Joaquin kit fox is yellow star thistle (*Centaurea melitensis*). Dense stands of this plant can form along roadsides and then spread into adjacent habitat. This plant displaces native vegetation, compete with native plants for resources, does not appear to be used by San Joaquin kit fox prey, dense growth, and may be difficult for the listed canine to move through due its large size (up to 3.3 feet tall), and numerous sharp spines (Cypher 2000). Other species that may disperse along roads and invade adjacent habitat include mustards (*Brassica* species) and Russian thistle (*Salsola tragus*) (Tellman 1997).

Disturbed soils and reduced competition from native plants are some of the conditions that facilitate invasion along roads by non-native plant species. Nitrogen from vehicle exhaust is deposited in habitats adjacent to roads, and the resulting enhanced nitrogen levels appear to promote growth of non-native species, particularly exotic grasses (Weiss 1999). These grasses, such as red brome (*Bromus madritensis rubens*) create dense ground cover in the San Joaquin Valley, and this dense cover appears to reduce habitat quality for various small mammal species, such as kangaroo rats, which are an important prey for San Joaquin kit foxes (Goldingay *et al.* 1997; Cypher 2000).

Roads may serve as travel corridors for non-native red foxes. Red foxes can kill San Joaquin kit foxes (Ralls and White 1995; U.S. Fish and Wildlife Service 1998), and likely compete with kit foxes for food and dens. Red foxes are considered a threat to the swift fox in Canada (Carbyn 1999). Red foxes are infrequently observed in large blocks of undisturbed habitat within the range of the San Joaquin kit fox, possibly due to the absence of permanent water or the presence of coyotes which prey upon red foxes. Along roads, water availability may be higher due to pooling of precipitation runoff or anthropogenic development, and coyotes may be less abundant

due to the presence of humans. Roads may facilitate movements of red foxes and increase access to kit fox habitat. Non-native red foxes and feral cats (*Felis catus*) are reported to use roads as movement corridors in Australia (Bennett 1991).

Negative effects to wildlife populations from roads may extend some distance from the actual road. The phenomenon can result from any of the effects already described in this biological opinion (e.g. vehicle-related mortality, habitat degradation, invasive exotic species, etc.). Forman and Deblinger (1998) described the area affected as the "road effect" zone. Along a 4-lane road in Massachusetts, they determined that this zone extend for an average of approximately 980 feet to either side of the road for an average total zone width of approximately 1970 feet. However, in places they detected an effect > 0.6 mile from the road. Rudolph *et al* (1999) detected reduced snake abundance up to 2790 feet from roads in Texas. They estimated snake abundance out to 2790 feet, so the effect may have been greater. Extrapolating to a landscape sale, they concluded the effect of roads on snake populations in Texas likely was significant, given that approximately 79% of the land area of the Lone Star State is within 1640 feet of a road. The "road-zone" effects can be subtle. Van der Zandt *et al.* (1980) reported that lapwings (*Vanellus vanellus*) and black-tailed godwits (*Limosa limosa*) feeding at 1575-6560 feet from roads were disturbed by passing vehicles. The heart rate, metabolic rate and energy expenditure of female bighorn sheep (*Ovis canadensis*) increases near roads (MacArthur *et al.* 1979). Trombulak and Frossell (2000) described another type of "road-zone' effect. Heavy metal concentrations from vehicle exhaust were greatest within 66 feet of roads, by elevated levels of metals in both soil and plants were detected at ≥660 feet) of roads. The "road-zone" apparently varies with habitat type and traffic volume. Based on responses by birds, Forman (2000) estimated the effect zone along primary roads of 1000 feet in woodlands, 1197 feet in grasslands, and 2657 feet in natural lands near urban areas. Along secondary roads with lower traffic volumes, the effect zone was 656 feet. The "road zone" and the San Joaquin kit fox has not been adequately investigated; however, it is possible it exists given the effects of roads on the animal.

California Tiger Salamander

The proposed Pigeon Pass Project is likely to result in a number of adverse effects to the California tiger salamander. The proposed project will eliminate and fragment the habitat of the listed amphibian, and increase levels of mortality of the animal during its movements between the breeding ponds and upland habitat. Individuals exposed during excavations likely will be crushed and killed or injured by construction-related activities. Salamanders also could fall into the trenches, pits, or other excavations, and then they could be directly killed or be unable to escape and be killed due to dessication, entombment, or starvation. The amphibians could be subject to increased levels of harassment resulting from lights used during night time construction. Edible trash left during or after repair activities could attract predators, such as racoons, crows, and ravens, to the sites, who could subsequently prey on the listed amphibian. Salamanders also may become trapped if plastic mono-filament netting is used for erosion control or other purposes where they would be subject to death by predation, starvation, or dessication (Stuart *et al.* 2001). The increased width of the road and higher levels of vehicle traffic will result in higher numbers of California tiger salamanders killed during their

movements between their upland habitat and breeding ponds. Individual California tiger salamanders may be directly injured, killed, harmed, and harassed by activities that disturb breeding, migration, dispersal, and aestivation habitat. The proposed project would result in the permanent loss of 19.1 acres and the temporary loss of approximately 68.0 acres of habitat of the California tiger salamander.

Construction related activities are likely to cause disruption of surface movement, disruption or complete loss of reproduction, harassment from increased human activity, and permanent and temporary loss of shelter. Because these animals are nocturnal, if construction is performed at night, associated lighting likely would increase all of the above effects. Wise and Buchanan (2002) reviewed the adverse effects that may result from night time illumination on salamander species. Artificial lighting used during night time construction may increase predation of the California tiger salamanders, if it occurs during periods of fall, winter, or spring rains, because the amphibians will lose the cover of darkness for movement. Nocturnal foraging by salamander species may be affected by artificial lighting. Wise and Buchanan (2002) reported that in one species of salamander, individuals emerged from refugia to forage within one hour after light levels dropped to dramatically following sunset. During such foraging bouts, visual information was used for locating prey. Greater light levels delay emergence, resulting in less foraging time, but could have increased the ability of the salamanders to capture prey; however, they also could make the amphibians more vulnerable to predation. Many salamanders, such as the California tiger salamander, are terrestrial as adults but migrate to ponds to breed and lay eggs. The orientation of some of these terrestrial species away from and toward these ponds is influenced by the spectral characteristics of light Wise and Buchanan 2002). Artificial lights that emit unusual spectra may disrupt these migration patterns.

The loss of ground squirrel burrows will reduce the amount of available upland habitat within the action area. The loss of the breeding pond will result in significantly reduced breeding opportunities for the California tiger salamander. The addition of impermeable surfaces resulting from the widened realignment will be accompanied by an increase in chemical runoff, which would include gasoline and oil, as well as silt runoff, which will reduce water quality in the project site. A wider highway to cross during dispersal and migration likely will result in increased injury and mortality of California tiger salamanders, and increased fragmentation of their habitat in the action area.

The effect of habitat fragmentation on the California tiger salamander is potentially significant. Fragmentation can have to effects: (1) reduction in access to habitat as well as habitat suitability, and (2) disruption of movements, dispersal, and gene flow. The construction of roads through salamander habitat may restrict or block movement between breeding ponds and upland habitat. The likelihood of this effect will increase with larger road size, higher traffic volume, and the presence of fences or median barriers. In addition to limiting access to breeding ponds or upland habitat, roads also may reduce the suitability of habitat for the California tiger salamander by fragmentation into patches too small for effective use by the animals. As a habitat patch decreases in size, the number of California tiger salamanders the patch can support also decreases. This increases the probability that the animals will be extirpated from each habitat

patch. The possibility for recolonization will depend upon the nature of the factors, e.g., roads, canals, development, etc., that are causing the fragmentation.

Fragmentation factors that effectively isolate patches and limit access also constitute barriers to California tiger salamander dispersal, and gene flow. Movements and dispersal corridors between breeding ponds and upland habitat are critical to this animal's population dynamics, particularly because the animals currently persist as metapopulations with multiple disjunct population centers. Movement and dispersal corridors likely are important for alleviating over-crowding during years when California tiger salamander abundance is high, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects.

Roads have been documented as barriers to movements by a diversity of species, and this effect varies with road size and traffic volume. The inhibition of animal movements caused by roads produces a significant effect by fragmenting habitats and populations (Joly and Morand 1997). Roads were found to be significant barriers to gene flow among common frogs (*Rana temporaria*) in Germany and this has resulted in genetic differentiation among populations separated by roads (Reh and Seitz 1990). Similarly, significant genetic subdivision was detected in bank voles (*Clethrionomys glarelous*) populations separated by a 50-meter (164 foot) wide highway in Germany (Gerlach and Musolf 2000).

California tiger salamander mortality and injury occurs when the animals attempt to cross roads and are hit by cars, trucks, or motorcycles. The majority of strikes occur on rainy nights when the animals are moving to their breeding ponds. Thus, vehicle strikes are a direct source of mortality for the California tiger salamander. If vehicle strikes are sufficiently frequent in a given locality, this could result in reduced abundance of this animal. Especially problematic is the death of females prior to the laying of their eggs because this could result in the loss of an entire cohort, and therefore, reduced recruitment of new individuals into the population.

Vehicles constitute a consistent source of mortality for the animal, based on the frequency with which vehicle strikes occur. Although no systematic, range-wide studies have been conducted, it is known that significant numbers of California tiger salamanders are killed by vehicular traffic while crossing roads (Hansen and Tremper 1993; S. Sweet, *in litt.* 1993; Joe Medeiros, Sierra College, pers. comm. 1993). For example, during a 1-hour period on a road bordering Lake Lagunita on the Stanford University campus, 45 California tiger salamanders were collected, 28 of which had been killed by cars (Twitty 1941). More recently, during one 15-day period in 2001 at a Sonoma County location, 26 road-killed California tiger salamanders were found (D. Cook, pers. comm. 2002). Overall breeding population losses of California tiger salamanders due to road kills have been estimated to be between 25 and 72 percent (Twitty 1941; S. Sweet *in litt.* 1993; Launer and Fee *in litt.* 1996). Mortality may be increased by associated roadway curbs and berms as low as 3.5 to 5 inches, which allow California tiger salamanders access to roadways but prevent their exit from them (Launer and Fee 1996; S. Sweet *in litt.* 1998).

In a recent study along a 0.7 mile high-vehicular-use (21,450 vehicles per day) section of the Trans-Canadian Highway in Alberta, Canada, Clevenger *et al.* (2001) recorded 183 road-killed eastern tiger salamanders in 30 days and concluded it was likely that very little of the local population had survived. In California, vehicular-use levels along various State, interstate, and secondary roads commonly far exceed the level of use reported in the Alberta study. Vehicular usage on California roads is also increasing rapidly and directly with human population and urban expansion. During November 2002, California's estimated total vehicular travel on State highway system roads alone was 14.27 billion miles (this figure and subsequent vehicular-use data from California Department of Transportation's Internet website which was accessed on January 2, 2003). From 1972 to 2001, State highway system total vehicular usage rose steadily from 67.11 to 167.81 billion miles annually. For the 23 California counties in which the California tiger salamander may occur, State highway system total annual vehicular usage in 1999, 2000, and 2001 was 53.27, 55.85, and 57.21 billion miles, respectively. The steady increase of vehicular use is thus continuing. We believe such figures illustrate (1) the general increase in vehicular usage that has been, and is still, occurring in many parts of the California tiger salamander's range, and (2) that additional increments of road-kill losses, which are already a potentially serious problem for the species, are likely occurring.

Vehicle-related mortality has significantly affected other listed or rare species. Rudolph *et al.* (1999) estimated that road-associated mortality may have depressed populations of Louisiana pine snakes (*Pituophis ruthveni*) and timber rattlesnakes (*Crotalus horridus*) by over 50% in eastern Texas, and this mortality may be a primary factor in local extirpations of this species of rattlesnake (Rudolph *et al.* 1998). Mortality from vehicles also is contributing to the reduction in the status of the prairie garter snake (*Thamnophis radix radix*) in Ohio (Dalrymple and Reichenbach 1984), and was a limiting factor in the recovery of the endangered American crocodile (*Crocodylus acutus*) in Florida (Kushland 1998).

Similar to the endangered San Joaquin kit fox California red-legged frog, the presence of roads could introduce chemical agents that contaminate and adversely affect the California tiger salamander and its prey; introduce or improve habitat for non-native species that compete or prey upon this listed amphibian; and also the "road zone" effect may adversely affect this listed animal.

<u>California Tiger Salamander Proposed Critical Habitat</u>

The proposed action is not expected to appreciably diminish the value of the proposed critical habitat for the California tiger salamander, or prevent the proposed critical habitat from sustaining its role in the conservation and recovery of the species. The California Department of Transportation is proposing to implement measures to restore the areas subject to the 17,655,367 cubic feet of cut and fill to pre-project conditions. There is currently an existing highway within the action area, and, due to the proposed restoration activities, realigning a section of that highway will not significantly interfere with the current capability of the proposed critical habitat to satisfy essential requirements of the species. Constituent elements for the California tiger salamander will remain intact during and after project completion, or will be restored, and will continue to provide suitable habitat.

California Red-legged Frog

Individual red-legged frogs may be directly injured, killed, harmed, and harassed by activities that disturb breeding, dispersal, and aestivation habitat. The proposed project would (1) result in the permanent loss of approximately 1.4 acres and the temporary loss of 3 acres of red-legged frog habitat; (2) result in the death of an unknown number of red-legged frogs; (3) result in construction related harassment, including effects from lights used during nighttime activities, to the surviving red-legged frogs on the site; (4) impede the dispersal of red-legged frogs through the site while the action is in progress; (5) increase the likelihood of predation; (6) fragment and reduce the amount of red-legged frog habitat in Alameda County.

Changes in light level may disrupt orientation in nocturnal animals. The range of anatomical adaptations to allow night vision is broad (Park 1940), and rapid increases in light can blind animals. For frogs, a quick increase in illumination causes a reduction in visual capability from which the recovery time may be minutes to hours (Buchanan 1993). After becoming adjusted to a light, frogs may be attracted to it as well (Jaeger and Hailman 1973). Laboratory experiments have demonstrated that dark-adapted frog species exposed to rapid increases in illumination may be temporarily "blinded" and unable to gather visual information on prey, predators, or conspecifics until their eyes adapt to the new illumination. Foraging may be facilitated in frog species that hunt around lights because the ambient illumination is increased to a level that allows the frogs to see prey or because lights attract abnormally large numbers of insects and other invertebrate prey. Experiments and anecdotal evidence indicates that both temporary and permanent changes to the night time illumination of an area may affect the reproduction, foraging, predator avoidance, and social interactions of frog species (Buchanan 2002). Reproductive behaviors may be altered by artificial lighting; it may be inhibited in frog species that normally reproduce only at very low illuminations. Female frogs of the species *Physalaemus pustulosus* are less selective about mate choice when light levels are increased, evidently preferring to mate quickly and avoid the increased predation risk of mating activity (Rand *et al.* 1997). Longcore and Rich (2002) reported that frogs in an experimental enclosure stopped mating activity during night football games, when lights from a nearby stadium increased sky glow. Mating choruses only resumes when the enclosure was covered to shield the frogs from light.Increased illumination may allow predators to see frogs that may not normally be visible to them. Circadian rhythms, activity patterns, and intraspecific visual communication also may be affected by increased illuminations.

Breeding habitat, identified as Site 1, will be eliminated by the proposed project. Individual frogs occupying the affected habitat run the risk of being crushed or buried by earth moving activities. Those that do survive will suffer permanent and temporary loss of habitat, and harassment from increased human activity. Construction of an unspecified duration and location will occur at night and the associated lighting may increase predation because frogs will lose the cover of darkness. In addition to the elimination of the breeding pond identified as Site 1, at certain times during construction the movement of frogs from breeding ponds north of State Route 84 to summer habitat south of State Route 84, and visa versa, likely will be impeded by construction activities. Temporary loss of dispersal habitat for the project duration increases

intra-and interspecific competition for food and living space for red-legged frogs in the action area.

The proposed action is likely to result in indirect effects to the red-legged frog that will last beyond the completion of the proposed action. The action would (1) result in permanent and temporal loss of aestivation habitat; (2) reduce water quality in the action area; (3) result in higher mortality of red-legged frogs in the action area; and (4) increase fragmentation of remaining red-legged frog habitat over the longer term.

Similar to the endangered San Joaquin kit fox and the California tiger salamande, the presence of roads could introduce chemical agents that contaminate and adversely affect the California red-legged frog and its prey; introduce or improve habitat for non-native species that compete or prey upon this listed amphibian; and also the "road zone" effect may adversely affect this listed animal.

The addition of impermeable surfaces resulting from the widened realignment will be accompanied by an increase in chemical runoff, which would include gasoline and oil, as well as silt runoff, which will reduce water quality in the project site. The widening of State Route 84 will likely result in higher mortality due to the increased distance that red-legged frogs have to travel over the highway to cross it. Removal of vegetation will likely increase exposure to introduced non-native and/or urban-adapted predators due to the permanent and temporary loss of cover to dispersing red-legged frogs.

California Red-Legged Frog Proposed Critical Habitat

The proposed action is not expected to appreciably diminish the value of the proposed critical habitat for the red-legged frog, or prevent proposed critical habitat from sustaining its role in the conservation and recovery of the species. The California Department of Transportation is proposing to implement measures to restore the areas subject to the 17,655,367 cubic feet of cut and fill to pre-project conditions. There is currently an existing highway within the action area, and, due to the proposed restoration activities, realigning a section of that highway will not significantly interfere with the current capability of the proposed critical habitat to satisfy essential requirements of the species. Constituent elements for the red-legged frog will remain intact during and after project completion, or will be restored, and will continue to provide suitable habitat.

Vernal Pool Fairy Shrimp

Vernal pool fairy shrimp may be directly injured, killed, harmed, and harassed by activities that damage their vernal pool habitat. The proposed project would directly eliminate 0.84 acre of vernal pools that provides habitat for this species, and fragment and reduce the acreage of the remaining for this listed crustacean habitat located in Alameda County.

The potential adverse effects of the proposed Pigeon Pass Project include habitat fragmentation; altered hydrology; non-point source pollution; dust emissions; erosion; sedimentation; hazardous material spills; human disturbance; and establishment of invasive nonnative plants. The project could potentially result in habitat fragmentation. The results of fragmentation are inhibition of genetic exchange between populations and impediments to recolonization of habitats from which populations have been extirpated. Small, isolated populations are substantially more vulnerable to stochastic events (e.g., aberrant weather patterns, fluctuations in availability of food) and may exhibit reduced adaptability to environmental (natural or anthropogenic) changes.

The Service considers all vernal pool branchiopods and their habitat not considered to be directly affected but within 250 feet of proposed construction activities to be indirectly affected by project implementation. Habitat indirectly affected includes all habitat supported by future destroyed areas and swales, and all habitat otherwise damaged by loss of watershed, human intrusion, introduced species, and pollution that will be caused by the proposed project. The proposed project will directly affect 0.61 acre and 0.2 ace of vernal pool will be indirectly affected by the proposed project. The new alignment will affected the vernal pool fairy shrimp through construction activities and long-term effects occurring within 250 feet of it. Individual branchiopods and their cysts, which may inhabit this seasonal wetland, may be injured or killed by any of the following indirect effects:

Erosion - The ground disturbing activities in the watershed of vernal pools associated with the proposed project action area are expected to result in siltation when pools fill during the wet season following construction. Siltation in pools supporting vernal pool fairy shrimp may result in decreased cyst viability, decreased hatching success, and decreased survivorship among early life history stages, thereby reducing the number of mature adults in future wet seasons. The proposed project construction activities could result in increased sedimentation transport into vernal pool branchiopod habitats during periods of heavy rains.

Changes in hydrology - The biota of vernal pools and swales can change when the hydrologic regime is altered (Bauder 1986, 1987). Survival of aquatic organisms like the vernal pool fairy shrimp are directly linked to the water regime of their habitat (Zedler 1987). Therefore, construction near vernal pool areas will, at times, result in the decline of local sub-populations of vernal pool organisms, including fairy shrimp.

Introduction of non-natives - There is an increased risk of introducing weedy, non-native plants into the vernal pools both during and after project construction due to the soil disturbance from clearing and grubbing operations, and general vegetation disturbance associated with the use of heavy equipment.

Chemical contamination - The runoff from chemical contamination can kill listed species by poisoning. Oils and other hazardous materials associated with construction equipment could be conveyed into the habitat of the vernal pool fairy shrimp by overland runoff during the rainy season, thereby adversely affected water quality. Many of these chemical compounds are thought to have adverse affects on this species. Individuals may be killed directly or suffer reduced

fitness through physiological stress or a reduction in their food base due to the presence of these chemicals.

In addition to the adverse effects detailed above, the proposed project will contribute to a local and range-wide trend of habitat loss and degradation, the principal reasons that the vernal pool fairy shrimp have declined. The proposed project will contribute to the fragmentation and reduction of the acreage of the remaining listed vernal pool branchiopod habitat located in western Alameda and throughout the range of this listed vernal pool branchiopod.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

From 1995 to 2020, the human population is projected to increase by 18 percent for the San Francisco Bay hydrologic region, while at the same time agricultural crop land use in the region is projected to remain around 65,000 acres (California Department of Water Resources 998). According the California Department of Forestry, from 2000 to 2020, the human population within counties in the Bay Area region is expected to grow by 29 percent (5.3 million people to 6.8 million people), and by 60 percent from 2000 to 2040 (5.3 million people to 8.4 million people) (California Department of Forestry 1998). There will likely be many other development projects that occur during this timeframe due to increases in human population growth that will continue to imperil the California tiger salamander, San Joaquin kit fox, California red-legged frog, and the vernal pool fairy shrimp.

The California Department of Parks and Recreation's Carnegie State Park is operated for use by off-highway vehicles. This State Park unit is located approximately 10 miles east of the Pigeon Pass Project along Corral Hollow Creek. Ongoing habitat degradation by off road vehicle use will continue to marginalize the available upland and riparian habitat along Corral Hollow Creek. Presently, there are plans to expand Carnegie State Park; any expansion of this Park could exacerbate the degradation of habitat in this area.

Within this region of Alameda County, there is a continued demand for new housing. Considering this, the remaining open space adjacent to the Pigeon Pass Project is likely threatened by development. Two developments, Ruby Hills and Vineyard Estates have already been constructed adjacent to the project site. The development of adjacent wildlife habitat will continue to result in the loss of not only breeding, resting, and foraging habitat, but the loss of dispersal corridors between breeding populations, thereby further isolating and fragmenting wildlife populations. Additionally, development of small reservoirs or water bodies, such as golf course hazards, and water diversions may occur which may pose further threats such as disruption of dispersal corridors for terrestrial species, and competition or predation from with non-native species such as bullfrogs for aquatic species.

CONCLUSION

After reviewing the current status of the vernal pool fairy shrimp, California tiger salamander, California red-legged frog, and the San Joaquin kit fox, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Pigeon Pass Project is not likely to jeopardize the continued existence of these four listed species. Critical habitat for the San Joaquin kit fox has not been proposed or designated, therefore, none will be affected by the proposed project. Critical habitat for the vernal pool fairy has been designated, however none is located in the action area, and therefore none will be affected by the proposed project. Critical habitat has been proposed for the California tiger and the California red-legged frog, however none will be adversely modified or destroyed. The Service reached the conclusion on the effects on the proposed critical habitat of the California red-legged frog and the California tiger salamander because the effects of the project will be offset by the conservation measures in the project description, including of the successful restoration of the areas subject to the 17,655,367 cubic feet of cut and fill to pre-project conditions.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the California Department of Transportation so they become binding conditions of project authorization for the exemption under 7(o)(2) to apply. The California Department of Transportation has a continuing duty to regulate the activity that is covered by this incidental take statement. If the California Department of Transportation (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of 7(o)(2) may lapse.

Amount or Extent of Take

The Service expects that incidental take of the San Joaquin kit fox will be difficult to detect or quantify because when this mammal is not foraging, mating, or conducting other surface activity,

it inhabits dens or burrows, the animal may range over a large territory, it is primarily active at night, it is a highly intelligent animal that is often is extremely shy around humans, and the finding of an injured or dead individual is unlikely because of their relatively small body size, Losses of this species also may be difficult to quantify due to seasonal fluctuations in their numbers. Therefore, the Service is estimating that all of the San Joaquin kit foxes inhabiting 79.2 acres (17. acres of permanent habitat loss, and 61.9 acres of temporary effect to the habitat of this species), as delineated in the biological assessment, will be subject to incidental take. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the Pigeon Pass Project in the form of harm and harassment of the San Joaquin kit fox caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

The Service anticipates that incidental take of the California tiger salamander will be difficult to detect because when this amphibian is not in their breeding ponds, or foraging, migrating, or conducting other surface activity, it inhabits the burrows of ground squirrels or other rodents; the burrows may be located a distance from the breeding ponds; the migrations occur on a limited period during rainy nights in the fall, winter, or spring; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Therefore, the Service is estimating that all California tiger salamanders inhabiting 87.1 acres (19.1 acres of permanent habitat loss, and 68 acres of temporary effects to the habitat of this species), as delineated in the biological assessment, will be subject to incidental take. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the Pigeon Pass Project in the form of harm, harassment, injury, and death of the California tiger salamander caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect because when this amphibian is not in their breeding ponds, it inhabits the burrows of ground squirrels or other rodents, or may be difficult to locate due to their cryptic appearance and behavior; the sub-adult and adult animals may be located a distance from the breeding ponds; the migrations occur on a limited period during rainy nights in the fall, winter, or spring; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Therefore, the Service is estimating that all California red-legged frogs inhabiting 4.4 acres (1.4 acres of permanent habitat loss, and 3 acres of temporary effects to the habitat of this species), based on the biological assessment and the November 8, 2004, site visit will be subject to incidental take. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the Pigeon Pass Project in the form of harm, harassment, injury, and death of the California red-legged frog caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

The Service anticipates that incidental take of the vernal pool fairy shrimp will be difficult to detect because when this crustacean is not in its active adult stage, the cysts or napulai are difficult to located in the vernal pools and seasonal wetlands; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of this species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Therefore, the Service is estimating that all vernal pool fairy shrimp inhabiting 0.84 acres of vernal pools and seasonal wetlands as delineated in the biological assessment and based on the November 8, 2004, site visit, will be subject to incidental take. Upon implementation of the Reasonable and Prudent Measures, incidental take associated with the Pigeon Pass Project in the form of harm, harassment, injury, and death of the vernal pool fairy shrimp caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox, California red-legged frog, California tiger salamander. Critical habitat for the San Joaquin kit fox has not been proposed or designated, therefore, none will be affected by the proposed project. Critical habitat for the vernal pool fairy has been designated, however none is located in the action area, and therefore will not be affected by the proposed project. Critical habitat has been proposed for the California tiger and the California red-legged frog, however none will be adversely modified or destroyed based on the proposed restoration of the areas subject to temporary distrubance.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effects of the Pigeon Pass Project on the San Joaquin kit fox, California tiger salamander, California red-legged frog, and the vernal pool fairy shrimp:

1. The California Department of Transportation shall implement conservation measures for the San Joaquin kit fox, California red-legged frog, California tiger salamander, and the vernal pool fairy shrimp to minimize (1) the effects of the loss of habitat that will occur as a result of the project; (2) the potential for harassment, harm, injury, and mortality to these four listed species; and (3) the potential for inadvertent capture or entrapment of federally listed wildlife species during construction activities.

2. The California Department of Transportation shall ensure their compliance with this biological opinion.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Federal Highway Administration shall ensure the California Department of Transportation complies with the

following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

A. The following Term and Conditions will implement Reasonable and Prudent Measure number one (1):

1. The California Department of Transportation shall minimize the potential for harm, harassment, or killing of the San Joaquin kit fox, California red-legged frog, California tiger salamander, and the vernal pool fairy shrimp resulting from project related activities by implementation of the conservation measures as described in the Biological Assessment, the letter from the California Department of Transportation to the Service dated February 15, 2005, and appearing in the *Project Description* of this biological opinion.

2. The California Department of Transportation shall include Special Provisions that include the avoidance and minimization measures of this biological opinion in the solicitation for bid information. In addition, the California Department of Transportation will educate and inform contractors involved in the project as to the requirements of the biological opinion.

3. As described in the February 15, 2005, letter from the California Department of Transportation to the Service, the 52 acres that will be purchased for the San Joaquin kit fox and the California tiger salamander via the Service's San Joaquin Kit Fox Fund shall be acquired within the geographic area inhabited by the same population segment of the California tiger salamander known as the East Bay Unit that is being adversely affected by the Pigeon Pass Project.

4. Prior to the initiation of groundbreaking activities associated with the implementation of the proposed project, the California Department of Transportation will compensate for direct effects to the habitat of the vernal pool fairy shrimp by purchasing, at a Service-approved conservation bank, for preservation credits that are equivalent of 1.45 acres of suitable vernal pool habitat for this listed species. Prior to the initiation of groundbreaking activities associated with the implementation of the proposed project, the California Department of Transportation will compensate for direct effects to the habitat of the vernal pool fairy shrimp by purchasing, at a Service-approved conservation bank, for creation credits that are equivalent of 0.61 acre of suitable vernal pool habitat for this listed species.

5. The California Department of Transportation biologist shall have oversight over implementation of all the Terms and Conditions in this biological opinion, and shall have the authority to stop project activities, through communication with the California Department of Transportation Resident Engineer, if any of the requirements associated with these Terms and Conditions are not being fulfilled. If biologist/construction liaison has requested a stop work due to take of any of

the listed species the Service and Fish and Game will be notified within one (1) working day via email or telephone

6. Permanent and temporary construction disturbances and other types of project-related disturbance to San Joaquin kit fox, California red-legged frog, California tiger salamander, and the vernal pool fairy shrimp habitat shall be minimized to the maximum extent practicable. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and other designated areas. These areas also should be included in preconstruction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

7. Project employees shall be directed to exercise caution when commuting within the habitats of the California tiger salamander, California red-legged frog, and the San Joaquin kit fox. A 20-mile per hour speed limit will be strongly encouraged on unpaved roads within listed species habitats.

8. Cross-country travel by vehicles shall be prohibited, unless authorized by the Service.

9. Project employees shall be provided with written guidance governing vehicle use, speed limits on unpaved roads, fire prevention, and other hazards.

10. Prior to initiation of ground breaking, the California Department of Transportation of or Service-approved biologist will conduct an education and training session for all construction personnel. All individuals who will be involved in the site preparation or construction shall be present, including the project representative(s) responsible for reporting take to the Service and the California Department of Fish and Game. Training sessions shall be repeated for all new employees before they access the project site. Sign up sheets identifying attendees and the contractor/company they represent shall be provided to the Service with the post-construction compliance report. At a minimum, the training shall include a description of the natural history of the San Joaquin kit fox, California tiger salamander, California red-legged frog, and the vernal pool fairy shrimp affected by the Pigeon Pass Project and include information on these four listed species and their habitats, as appropriate. The training shall include the general measures that are being implemented to conserve these species as they relate to the project, the penalties for non-compliance, and the boundaries (work area) of the project. To ensure that employees and contractors understand their roles and responsibilities, training shall be conducted in languages other than English, as appropriate.

11. A litter control program shall be instituted at the entire Pigeon Pass Project. All workers ensure their food scraps, paper wrappers, food containers, cans, bottles,

and other trash from the project area are deposited in covered or closed trash containers. The trash containers shall be removed from the project area at the end of each working day.

12. No canine or feline pets or firearms (except for Federal, State, or local law enforcement officers and security personnel) shall be permitted at the Pigeon Pass Project to avoid harassment or killing or injuring of the San Joaquin kit fox, California red-legged frog, and the California tiger salamander.

13. Maintenance and construction excavations greater than 2 feet deep either shall be covered, filled in at the end of each working day, or have earthen escape ramps no greater than 200 feet apart provided to prevent entrapment of listed species.

14. All construction activity shall be confined within the Pigeon Pass Project site, which may include temporary access roads, haul roads, and staging areas specifically designated and marked for these purposes, as described in Conservation Condition 18 below. At no time shall equipment or personnel be allowed to adversely affect areas outside the project site without authorization from the Service.

15. The Resident Engineer or their designee shall be responsible for implementing these conservation measures and shall be the point of contact for the Pigeon Pass Project.

16. All grindings and asphaltic-concrete waste shall be stored within previously disturbed areas absent of habitat and at a minimum of 150 feet from any culvert, wash, pond, vernal pool, or stream crossing.

17. The California Department of Transportation shall submit to the Service their draft proposal for the restoration of temporarily affected listed species habitatand proposed critical habitat to pre-project conditions at least sixty (60) days prior to initial ground breaking at the Pigeon Pass Project; the final plan shall be submitted for approval by the Service prior to ground breaking at the proposed project. The plan shall include restoration and revegetation work associated with temporary effects using native California plant species from on-site or local sources (i.e., local ecotype). Plant materials from non-local sources shall be allowed only with written authorization from the Service. To the maximum extent practicable (i.e., presence of natural lands), topsoil shall be removed, cached, and returned to the site according to successful restoration protocols. Loss of soil from run-off or erosion shall be prevented with straw bales, straw wattles, or similar means provided they do not entangle, block escape or dispersal routes of listed animal species. The draft and final plan shall contain specific quantifiable criteria to evaluate the success of the restoration.

18. The Pigeon Pass Project construction area shall be delineated with high visibility temporary fencing at least four (4) feet in height, flagging, or other barrier to prevent encroachment of construction personnel and equipment onto any sensitive areas during project work activities. Such fencing shall be inspected and maintained daily until completion of the project. The fencing will be removed only when all construction equipment is removed from the site. Actions within the project area shall be limited to vehicle and equipment operation on existing roads. No project activities will occur outside the delineated project construction area.

19. Prior to any ground disturbance, pre-construction surveys shall be conducted for San Joaquin kit fox, California tiger salamander, and the California red-legged frog. These surveys will consist of walking surveys of the project limits and adjacent areas accessible to the public to determine presence of the species (i.e., kit fox dens and related sign).

20. Only Service-approved biologists holding valid permits issued pursuant to section 10(a)(1)(A) of the Act will be allowed to trap or capture listed species. Any relocation plan will be approved by the Service prior to release of any listed species.

21. Because dusk and dawn are often the times when San Joaquin kit fox, California red-legged frog, and the California tiger salamander are most actively foraging and dispersing, all construction activities should cease one half hour before sunset and should not begin prior to one half hour before sunrise. Except when necessary for necessary construction, driver or pedestrian safety, lighting of the Pigeon Pass Project site by artificial lighting during night time hours should be minimized to the maximum extent practicable.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the Pigeon Pass Project site to ensure that the California red-legged frog and the/or the California tiger salamander do not get trapped. This limitation will be communicated to the contractor through use of Special Provisions included in the bid solicitation package.

23. Use of rodenticides and herbicides at the Pigeon Pass Project site shall be utilized in such a manner to prevent primary or secondary poisoning of listed species, and the depletion of prey populations on which they depend. All uses of such compounds hall observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Pesticide Regulation, and other appropriate State and Federal regulations, as well as additional project-related restrictions deemed necessary by the Service or the California Department of Fish and Game.

24. The following Term and Condition shall be implemented for borrow sites associated with the Pigeon Pass Project:

a. The California Department of Transportation shall require as part of the construction contract that all contractors comply with the Act in the performance of the work necessary for project completion performed inside and outside the project right-of-way.

b. The California Department of Transportation shall require documentation from the contractor that aggregate, fill, or borrow material provided for each project was obtained in compliance with the Act. Evidence of compliance with the Act shall be demonstrated by providing the Resident Engineer any one of the following:

i. a letter from the Service stating use of the borrow pit area will not result in the incidental take of listed species;
ii. an incidental take permit for contractor-related activities issued by the Service pursuant to section 10(a)(1)(B) of the Act;
iii. a biological opinion or a letter concurring with a "not likely to adversely affect" determination issued by the Service to the Federal agency having jurisdiction over contractor-related activities;
iv. letter from the Service concurring with the "no effect" determination for contractor-related activities; or
v. Contractor submittal of information to the California Department of Transportation Resident Engineer indicating compliance with the State Mining and Reclamation Act (SMARA) and provide the County land use permits and California Quality Act (CEQA) clearance.

c. If a borrow site that is in compliance with the Act is not available, the California Department of Transportation shall either:

i. identify/select a site that the Service has concurred with the "no effect" determination, or;
ii. request reinitiation of formal consultation on the action considered herein based on new information.

25. The California Department of Transportation shall implement the following six general conservation measures for the San Joaquin kit fox:

a. The presence/absence of San Joaquin kit fox dens (natural or in pipes and culverts) shall be determined.

i. Pre-construction surveys within the project area shall be conducted no more than thirty (30) calendar days prior to the start of construction in accordance with the most current protocols approved by the Service and the California Department of Fish and Game.

ii. Surveys for dens shall be conducted by qualified biologists with demonstrated experience in identifying San Joaquin kit fox dens.

iii. Pipes and culverts shall be searched for kit foxes prior to being moved or sealed to ensure that an animal has not been trapped.

b. All San Joaquin kit fox dens shall be protected to the maximum extent practicable as determined by the on-site biologist.

c. The type of den (natal or non-natal) and its status (occupied or unoccupied) shall be identified based on the most current Service guidance (U.S. Fish and Wildlife Service 1999):

i. Known den: any existing natural den or human-made structure for which conclusive evidence or circumstantial evidence can show that the den is used or has been used at any time in the past by the San Joaquin kit fox.

ii. Potential den: any natural den or burrow within the range of the species that has entrances of appropriate dimensions (4 to 12 inches in diameter) to accommodate San Joaquin kit foxes. The California Department of Transportaion shall survey and investigate using photo-detection equipment, track plate, or other methods to determine species utilization. If no information is collected that would indicate use by other species, the den shall be treated as a potential kit fox den.

iii. Pupping den: any known San Joaquin kit fox den (as defined) used by kit foxes to whelp and/or rear their pups.

iv. Atypical den: any known San Joaquin kit fox den that has been established in, or in association with, a human-made structure.

d. Identify and execute appropriate action(s) regarding notification, buffers, excavation and fill, or seal-off:

i. Occupied natal den: if an occupied natal den is visible or encountered within the project limits, or other accessible land, or

on accessible land within 1000 feet of the project construction area, the project will be constructed between August 1 and November 30 and the Service shall be contacted immediately, before any project action occurs.

ii. A buffer or exclusion zone shall be established to protect the physical den and surrounding habitat of unoccupied natal dens and all non-natal dens that can be avoided:

e. Unoccupied natal dens shall be surrounded with a 200 feet buffer and the Service will be contacted. Occupied and unoccupied non-natal dens shall be surrounded with a 100 feet buffer.

f. When occupied dens have been found on or near the project site, ground disturbing activities shall be restricted during the period December 1 to July 31.

g. During this period, project activities within 0.3 mile of occupied natal dens are prohibited. Buffer zones shall be delineated with a temporary fence or other suitable barrier that does not prevent disbursal of the San Joaquin fox. Alternately, the project construction area can be delineated with temporary fence, flagging, or other barrier.

h. Pipes or culverts with a diameter greater than 4 inches shall be capped or taped closed when it is ascertained that no San Joaquin kit fox is present. Any San Joaquin kit fox found in a pipe or culvert shall be allowed to escape unimpeded.

i. If an unoccupied natural San Joaquin kit fox den cannot be avoided and must be destroyed, the following actions shall be followed:

i. Prior to the destruction of any den, the den shall be monitored for at least 3 consecutive days to determine its current status. Activity at the den shall be monitored by placing tracking medium at the entrance and by standard spotlighting detection techniques. If no San Joaquin kit fox activity is observed during this period, the den shall be destroyed immediately to preclude subsequent use. If San Joaquin kit fox activity is observed at the den during this period, the den shall be monitored for at least 5 consecutive days from the time of observation to allow any resident animal to move to another den during its normal activities. Use of the den can be discouraged during this period by partially plugging the entrance(s) with soil in such a manner that any resident animal can escape easily. Destruction of the den may begin when, in the judgment of a Service or Service-approved biologist, the animal has moved to a

different den. The biologist shall be trained and familiar with San Joaquin kit fox biology. If the animal is still present after five or more consecutive days of plugging and monitoring, the den may be excavated when, in the judgment of the Service-approved biologist, it is temporarily vacant, for example during the animal's normal foraging activities.

ii. All San Joaquin kit dens shall be excavated by hand, by or under the supervision of, a Service-approved biologist.

iii. The den shall be fully excavated and then filled with dirt and compacted to ensure that San Joaquin kit foxes cannot reenter or use the den during the construction period. If, at any point during excavation a kit fox is discovered inside the den, the excavation activity shall cease immediately and monitoring of the den shall be resumed. Destruction of the den may be resumed, when in the judgment of the Service-approved biologist, the animal has escaped from the partially destroyed den.

iv. Non-natal San Joaquin kit dens may be excavated at any time of the year; natal dens shall be excavated only between August 15 and November 1.

B. The following Terms and Conditions implement Reasonable and Prudent Measure two (2):

1. If requested, during or upon completion of construction activities, the on-site biologist, and/or a representative from California Department of Transportation shall accompany Service or California Department of Fish and Game personnel on an on-site inspection of the site to review project effects to the San Joaquin kit fox, California red-legged frog, California tiger salamander, vernal pool fairy shrimp, and their habitats.

2. The Federal Highway Administration shall ensure California Department of Transportation complies with the *Reporting Requirements* of this biological opinion.

Reporting Requirements

Injured San Joaquin kit foxes, California red-legged frogs, and/or California tiger salamanders must be cared for by a licensed veterinarian or other qualified person; dead individuals of any of these three listed species and the vernal pool fairy shrimp should be preserved according to standard museum techniques and held in a secure location. The Service and the California Department of Fish and Game must be notified within one (1) working day of the discovery of death or injury to a San Joaquin kit fox, California red legged frog, California tiger salamander, and/or vernal pool fairy shrimp that occurs due to project related activities or is observed at the

project site. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. The Service contacts are Chris Nagano, Deputy Assistant Field Supervisor (Endangered Species Program – Central Valley) at the Sacramento Fish and Wildlife Office (916/414-6600), and Scott Heard, Resident Agent-in-Charge of the Service's Law Enforcement Division at 916/414-6660. The California Department of Fish and Game contact is Mr. Ron Schlorff at 1416 9th Street, Sacramento, California 95814, (916) 654-4262.

The California Department of Transportation shall submit a post-construction compliance report prepared by the on-site biologist to the Sacramento Fish and Wildlife Office within sixty (60) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the San Joaquin kit fox, California red-legged frog, California tiger salamander, and the vernal pool fairy shrimp, if any; (v) occurrences of incidental take of any of these four listed species, if any; and (vi) other pertinent information

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to implement recovery actions, to help implement recovery plans, to develop information, or otherwise further the purposes of the Act.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations. We propose the following conservation recommendations:

1. The California Department of Transportation should assist the Service in implementing recovery actions identified in the *Recovery Plan for the California red-legged Frog* (U.S. Fish and Wildlife Service 2002).

2. The California Department of Transportation should assist the Service in developing and implementing recovery actions identified in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998).

3. The California Department of Transportation should incorporate culverts, tunnels, or bridges on highways and other roadways that allow safe passage by California tiger salamanders, California red-legged frogs, San Joaquin kit foxes, other listed animals, and wildlife. The California Department of Transportation should include photographs, plans, andother information in their biological assessments if they incorporate "wildlife friendly" crossings into their projects.

4. The Federal Highway Administration and the California Department of Transportation should consider participating in the planning for a regional habitat conservation plan for the San Joaquin kit fox, California tiger salamander, other listed species, and sensitive species.

5. The California Department of Transportation should consider establishing functioning preservation and creation conservation banking systems to further the conservation of the California tiger salamander, San Joaquin kit fox, listed crustacean species, and other appropriate species. Such banking systems also could possibly be utilized for other required mitigation (i.e., seasonal wetlands, riparian habitats, etc.) where appropriate.

6. Sightings of any listed or sensitive animal species should be reported to the California Natural Diversity Database of the California Department of Fish and Game. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

7. The California Department of Transportation should provide habitat for bats, including surfaces for bat roosts on the underside of bridges and other structures whenever possible.

REINITIATION - CLOSING STATEMENT

This concludes the conference for effects of the proposed addition of truck climbing lanes and curve corrections to State Route 84 (Pigeon Pass Project) in Alameda County, California, on the critical habitats for the California red-legged frog and California tiger salamander. You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if either of these critical habitats are designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

This concludes formal consultation on the proposed addition of truck climbing lanes and curve corrections to State Route 84 (Pigeon Pass Project) in Alameda County, California. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this biological opinion on the Pigeon Pass Project, please contact the Deputy Assistant Field Supervisor (Endangered Species Program – Central Valley) at the letterhead address or at telephone 916/414-6600.

Sincerely,

Cay C. Goude
Acting Field Supervisor

cc:
Susan Chang, Jeff Jensen, California Department of Transportation, Oakland, California
Larry Eng, California Department of Fish and Game, Rancho Cordova, California
Dee Warenycia, California Department of Fish and Game, Sacramento, California
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